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US EPA Region 8
Denver, CO

Submitted by:
Atlantic Richfield Company
Anchorage, AK
July 7, 2011

Initial Solids Removal Plan

Rico-Argentine Mine Site – Rico Tunnels
Operable Unit OU01
Rico, Colorado

Atlantic Richfield Company

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July 7, 2011

Mr. Steven Way
On-Scene Coordinator
Emergency Response Program (8EPR-SA)
US EPA Region 8
1595 Wynkoop Street
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Subject: Initial Solids Removal Plan
Rico-Argentine Mine Site – Rico Tunnels
Operable Unit OU01 Rico, Colorado

Dear Mr. Way,

Please find enclosed three (3) copies of the revised *Initial Solids Removal Plan*, including a memorandum with responses to specific comments as Appendix E, both dated June 30, 2011; in addition, an electronic copy of the combined documents in PDF file format is being submitted via email. Atlantic Richfield is submitting the revised document and response to comments pursuant to comments received from EPA by email dated May 27, 2011, and in accordance with the Removal Action Work Plan, Rico Project – Rico Soils and St. Louis Ponds Rico, Colorado dated March 9, 2011.

If you have any questions, please feel free to contact me at 406.491.1129.

Sincerely,

Chuck Stilwell, P.E.
Project Manager
Atlantic Richfield Company

Enclosures

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1.0 Introduction

1.1 Purpose

This Initial Solids Removal Plan (Plan) addresses the overall removal and drying of solids from all of the upper ponds at Operable Unit OU01 of the Rico-Argentine Mine Site – St. Louis Tunnel (Site) responsive to the requirements of Section 5.2.1 of the Removal Action Work Plan, Rico-Argentine Mine Site – Rico Tunnels, Operable Unit OU01 Rico, Colorado dated March 9, 2011 (see Figure 1 for Site location). As described below, this Plan focuses on the near-term removal of solids at Pond 18 and construction and operation of an interim drying facility. This initial removal and interim drying of existing solids from Pond 18 will also provide field-scale data to evaluate the best means and methods for removal and drying of existing solids from the remaining upper ponds and also for management of future lime solids that are expected to be generated as part of the future water treatment system. A general plan and schedule for all initial solids removal is provided, but will be refined upon evaluation of the Pond 18 solids removal. This initial solids removal will result in the majority of existing pond solids being moved from the active settling ponds of the treatment system, and ultimately being placed in a secure on-site repository.

1.2 Scope

A substantial portion of the existing precipitation solids and sediments (hereinafter typically referred to as solids) in the upper ponds (Ponds 18, 15, 14, 13, 12 and 11 – from north to south) will be removed, dried, and eventually disposed of in a future on-site repository. The solids removal will begin in the summer of 2011 at Pond 18 and placement of solids in an on-site solids repository will be completed no later than December 2014 as described more fully in Section 5.0 below. An overall plan of the portion of the ponds system encompassing the upper ponds is shown in Figure 2.

The currently envisioned means and methods of removal and interim drying of Pond 18 solids are described in this Plan. The specific detailed methods utilized will be determined in the field based on: current site conditions in Pond 18 and at the interim drying facility site; weather conditions during the removal and interim drying period (precipitation, evaporation and wind); performance of the equipment used for removal of sediments; and the performance of the interim drying facility.

An interim drying facility will be constructed in summer 2011 to allow drying and storage of the portion of the existing solids to be removed from Pond 18, pending construction of the planned on-site solids repository. The solids in the remaining upper ponds will be processed in the interim drying facility, or a permanent drying facility to be constructed together with the solids repository, depending on when they are removed.

The interim drying facility will be constructed with up to four (4) separate cells to facilitate full-scale testing of alternative drying methods and also provide information valuable to designing a permanent drying facility and establishing operational procedures. Data will be collected and observations documented for the major elements of the removal and interim drying processes during the initial Pond 18 solids removal. The method of solids removal and drying will be modified for subsequent solids removal, as informed by the field experience gained during the Pond 18 removal this summer.

1.3 Precipitation Solids Inventory

Precipitation solids have accumulated in the upper ponds (Ponds 11-15 and 18) at the Site as a result of precipitation and setthng of metal complexes by natural processes and by prior addition of lime to the St. Louis Tunnel discharge from approximately 1984 to 1995. It is also possible that some amount of sediment eroded from the floor of the underground workings in the St. Louis Tunnel and/or from the bed and walls of the open channel outside the tunnel have been conveyed by the St. Louis Tunnel discharges to Pond 18 and possibly to the other upper ponds.

An inventory of existing solids was performed in 2001[1] by precision surveying utilizing a sampling boat outfitted with a survey prism and depth sounding rods. The estimated volume of solids as of the time of the 2001 surveys in each of the upper ponds investigated is summarized as follows:

- Pond 18 – 20,000 cubic yards (see discussion below regarding current estimated volume)
- Pond 15 – 11,000 cubic yards (see discussion below regarding calcine taihngs beneath solids)
- Pond 14 – 2,600 cubic yards
- Pond 13 – not inventoried (see discussion below with estimate of current solids volume)
- Ponds 11 and 12 – 10,600 cubic yards

A total in-place volume of 44,200 cubic yards (cy) of solids was estimated from the 2001 surveys and probing (not including material in Pond 13 or calcine tailings found at the bottom of Pond 15, and prior to the initial in-pond dewatering of solids in Pond 18, as discussed below).

Following the original survey of sediment volumes in 2001, water was re-routed around Pond 18 for a period of 10 months to allow the pond solids to dewater (as discussed in Section 1.4 below) and the solids were observed to consohdate in place. Also, a small volume of solids was removed for use in the pilot scale test cells in Ponds 16/17 in 2002. Water was again re-routed around Pond 18 in late fall 2010 and has continued to bypass the pond to present (approximately 7 months to date). Based on a recent survey of the surface of the solids in Pond 18 performed in April 2011 and the original pond bottom probing performed in 2001, it is estimated that Pond 18 currently contains approximately 13,000 cubic yards of solids (see additional discussion in Section 1.4 below).

Sampling of the fiill section of material in Pond 15 during the 2001 investigation revealed that the total volume of material in the pond was approximately 19,000 cy, of which approximately 40-45 percent (or about 8,000 cy) was calcine tailings underlying the precipitation solids. There was also an indication of a minor amount of calcine tailings at the bottom of Pond 18, but not enough to merit separate accounting.

[1] Unpublished file information prepared by SEH, Inc.

The exposed surface of the material in the periodically unsubmerged portion of off-line Pond 13 appears to be comprised of precipitation solids. The nature of the materials at depth in Pond 13 is unknown. Review of boring and test pit logs in the dikes surrounding the pond indicates that the earthfill is locally mixed with some calcine tailings. This suggests the possibility that some portion of the materials below the solids exposed at the surface in Pond 13 may be calcine tailings, as was found in prior sampling in Pond 15. Given the very soft condition of the exposed near-surface materials and the very shallow water depth on the submerged portion of the pond during the 2001 surveys, Pond 13 could not be safely accessed for depth measurement or sampling. In the absence of survey/probe data, the order of magnitude volume of material in Pond 13 has been estimated as 20,000 cy based on topographic spot elevations in the unsubmerged portion of the pond from a pre-1995 topographic map of the Site and an estimate of the elevation of the pond bottom extrapolated from data in the adjacent probed ponds.

Relatively few settled solids were observed below Pond 11 and those ponds are not included in the removal, drying and repository storage plans for the Site.

Based on prior site geologic and geotechnical investigations (see geologic map and sections in Appendix A and boring and test pit logs in Appendix B), it is inferred that the bottom of Pond 18 was excavated into underlying predominantly coarse-grained (sand, gravel and cobble) alluvial aquifer deposits. Measurements of water levels in monitoring wells adjacent to Pond 18, as supported by readings in temporary piezometers installed in 2001-2002, indicate that the depth to groundwater within the pond solids has varied from the top surface to near the bottom of the pond solids reflecting a range of seasonal and climatic (drought versus wet period) conditions. Recent measurements over the past 10 months of the nearest monitoring wells indicate that groundwater levels were highest in July and lowest in December-March. The highest groundwater levels project to about two (2) to three (3) feet above the average bottom elevation of solids in Pond 18, and the lowest levels project to the approximate average bottom elevation of solids in Pond 18.

1.4 Pond 18 Solids Characteristics

Paser (1996)[2] recovered piston-style core samples of the solids from Pond 18, which at that time were approximately 8 feet thick. Subsequent detailed grid probing in 2001 indicated an average sediment thickness of 10.5 feet.

Based on previous testing in 2002[3] of minimally disturbed core samples from Ponds 11, 12, 14, 15 and 18 acquired in 2001, the settled precipitation solids (prior to any in-pond consolidation by dewatering during low groundwater periods) are estimated to have a weighted average solids content (weight of dry solids/total wet weight) of 12.9 percent and an average particle specific gravity of 2.42. Following a planned dewatering exercise from September 2001 to June 2002, which included a winter groundwater level at or below the base of Pond 18, the average bulk unit weight of the solids was estimated at 23 pcf Based on a recent survey of the top of solids in Pond 18 made in April 2011 and the 2001 pond bottom contours, it is estimated that there are approximately 13,000 cubic yards of solids in

[2] Paser, Kathleen S. 1996. Characterization of and Treatment Recommendations for the St. Louis Adit Drainage and Associated Settling Ponds in Rico, Colorado: MS Thesis, Colorado School of Mines. August 30.

[3] Unpublished file information prepared by SEH, Inc.

Pond 18, and that the average thickness of the solids is on the order of four (4) to five (5) feet.

Permeability testing of the solids has not been performed due to the significant physical access challenges and safety concerns of working on water over the solids or accessing equipment directly on the very soft solids surface where unsubmerged. Estimates of vertical permeability of the in situ solids in Pond 18 as of 2002 based on column testing of solids sampled from the pond were on the order of $8x10^{-5}$ cm/sec for the modeled pre-dewatering case and $3x10^{-5}$ cm/sec for the in-pond consolidation model[1]. These estimated vertical permeabilities of undisturbed solids appear generally consistent with the bulk unit weight and fine-grained nature of the solids. Given the approximately seven (7) additional months that water has recently been routed around Pond 18, it is possible that some additional consolidation and settlement has occurred, and that the current vertical permeability may be somewhat lower.

These laboratory-scale estimates have also been compared to an estimate made by proportioning the total previously estimated seepage from all active ponds from Pond 18 through Pond 5 (estimated by a mass balance calculation of surface flows and evaporation as approximately 250 gpm or 0.56 cfs) to each pond based on its bottom area. On this basis, the back-calculated overall average vertical permeability (K_v) for the Pond 18 solids would be on the order of 1×10^{-5} cm/sec. Given that this mass-balance derived estimate includes the lower Ponds 9 through 5 with little to no visible solids, it is not unreasonable to estimate that the actual average vertical permeability of the Pond 18 solids on this basis would be somewhat lower.

2.0 Solids Removal

Two primary altematives will be evaluated and tested in the field to arrive at one or more acceptable procedures to remove and transport solids from Pond 18 to the interim drying facility. The informadon gathered during the Pond 18 removal in the summer of 2011 will serve as the initial basis for selection of the removal method(s) for the other upper ponds during 2012-2013, with any appropriate modifications in the chosen method to reflect specific conditions that are encountered during the actual removal.

The first altemative is use of conventional earthmoving equipment, which is believed most suitable for solids to be excavated above the groundwater table at the time of removal based on pilot scale investigations conducted in 2001-2002. This altemative will involve the following steps:

1) Route incoming flow around Pond 18 to the next downgradient pond in the flow path (Pond 15) (this step was completed in fall 2010).
2) Decant and pump off remaining surface water from Pond 18 to allow additional solids consolidation in-place for as long as the overall constmction schedule would allow (completed in fall 2010); pump snowmelt and precipitation accumulated since fall 2010 to Pond 15 prior to commencing removal in 2011.
3) Excavate solids with conventional earthmoving equipment, likely including a low ground pressure tracked excavator with extended boom reach and possibly a

mbber tire or tracked loader; swamp pads and/or earthen causeways may be required to access and facilitate controlled removal of solids.

4) Haul solids by tmck and/or loader to the interim drying facility.

5) Deposit and spread solids in drying cells at the interim drying facility, using a small dozer and possibly a small conventional loader and/or skid-steer loader.

It is proposed to leave approximately two (2) feet of solids relatively undisturbed in the bottom of Pond 18 to limit seepage loss to the underlying predominantly coarse-grained alluvial aquifer. Based on the informadon from the 2001 investigation described previously and recent survey of the current top of the solids, it is estimated that approximately 5,000 cy of the 13,000 cy in Pond 18 will be left in place. Special care will be taken by means and methods to be determined in the field to minimize to the extent practical over-excavation of the solids to remain in place.

Secondly, a dredging alternative will be evaluated. This altemative would involve:

1) Perform a limited pilot test of removing un-dewatered solids from Pond 15 using a floating suction dredge.

2) Take measures to limit any additional solids being moved from Pond 15 to the lower ponds during the test including, but not necessarily limited to: a. the test will be performed on the upper portion of the pond to allow solids suspended in the water column opportunity to settle out within the pond; b. the Pond 15 outlet will be blocked or re-routed (possibly to Pond 13) during the test; c. water quality samples will be taken at the ponds system discharge point to the river; and d. the test will be of a relafively short duration.

2) Dredge solids with a suction dredge with an appropriately designed, continuously agitating suction head to counteract the apparent thixotropic-like behaviour (i.e., tendency for solids to behave as a solid versus as a slurry in the absence of constant agitation) observed during the 2001-2002 pilot scale dewatering and removal exercise at Pond 18;

3) Convey solids via pipeline to a separate cell, sub-cell, or tank in the interim drying facility, which will not be mixed with solids removed from Pond 18 so as not to compromise the drying of Pond 18 solids.

4) If necessary, excess water removed to the interim drying area during the test can be decanted, or actively pumped, back to Pond 15 or Pond 13 once initial solids settling has occurred.

As necessary to develop and prove the feasibility of the dredging altemative, a dredging contractor may be engaged to perform field-scale trial removal from Pond 18, but only after more consolidated, dried solids have already been removed with conventional equipment. This will be dependent on the amount and water-content of remaining solids in Pond 18. This option will be considered after significant solids removal in Pond 18 has occurred, and the viability of removing additional solids with a dredge has been assessed in the field. As in the case of the conventional excavation method, approximately two (2) feet of sediment will be left in the bottom of Pond 18. Again, special care will be exercised to develop a means to ensure that disturbance of the solids to remain is minimized to maintain their lining effect.

3.0 Interim Drying Facility

3.1 Siting

The available open ground in the former Ponds 16/17 area is planned to be used for the interim drying of solids removed from Pond 18 as shown on Figure 2. This location is strongly preferred considering:

- Close proximity to Pond 18 and the other upper ponds containing the majority of the solids to be processed limits transport distances.
- Existing accessibility to both conventional equipment for cell constmction and solids placement and piping for dredge discharge;
- Surface grade is above the seasonal high groundwater level so that downward drainage of the placed wet solids will not be impeded by underlying groundwater;
- Sufficient gently sloping ground is present for placement of Pond 18 solids in a relatively thin layer to promote more efficient drainage and consolidation;
- Existing ground generally slopes in an advantageous direction to promote drainage of dewatering water along the base of the placed solids while minimizing the cut/fill; and
- Available grade is present for gravity conveyance of dewatered pore water from the consolidating solids to Pond 15 in the active ponds system.

Use of this interim facility for drying of solids removed from Ponds 11 through 15 during 2012-2013 will be considered depending on the performance observed during 2011 and on later decisions regarding the layout and design of the ponds treatment system and solids repository. The potential to convert an interim drying facility at this location to a permanent facility is also considered feasible based on information and evaluations to date.

Altemative locations for the interim drying facility were considered, but determined less feasible than the Ponds 16/17 area. These locations include the relatively open flat area north of Pond 18 and the currently off-line Pond 13. Disadvantages of the north area site as compared to the Ponds 16/17 site include: 1) having to transport removed solids considerably further and upslope by about 6-18 feet of elevation more; 2) the need to completely encircle the site with a containment dike; and 3) significantly more grading of the subgrade to promote gravity drainage of non-infiltrating dewatering water to a down-gradient sump. The Pond 13 altemative site is seasonally submerged by an estimated one (1) to two (2) feet of water and was therefore not considered further. If necessary based on later decisions regarding the layout and design of the ponds treatment system primary settling pond and the solids repository, one or both of these sites could be further considered during siting and design of the permanent drying facility.

3.2 Site Geologic and Groundwater Conceptual Model

The conceptual geologic model of the preferred site for the interim drying facility is illustrated in plan and sections on figures in Appendix A. The immediate site consists nearly

entirely of calcine tailings overlying alluvium of the Dolores River valley. A thin veneer (ranging from less than a foot to up to about two feet) of mixed fill, mine waste and debris is locally present at the surface of portions of the Ponds 16/17 area. The eastern side of the site locally overlies the toe of the waste rock pile placed during constmction of and subsequent mining in the St. Louis Tumel and cross-cuts. The westem limit of the site area abuts embankment fill over alluvium retaining Ponds 18 and 15 to the west; the southem site boundary lies along the embankment separating Ponds 16/17 from Pond 13 (that in tum overlies alluvium); and the site is bounded on the north by mixed fill, mine waste and debris overlying alluvium.

Groundwater is present in the alluvium beneath the site areas at depths on the order of five (5) to 10 feet based on the groundwater level data shown on the sections in Appendix A. Note that although the available groundwater data spans a very substantial period of time (nearly 30 years), the groundwater levels inferred from the data appear remarkably consistent and reasonable. Based on the available data, the gradient of flow in the groundwater has a component from north to south (as would be expected following the downstream slope of the shallow alluvial aquifer along the Dolores River), and also a component from east to west (consistent with groundwater discharging from CHC Hill/Telescope Mountain) toward the Dolores River). The deeper calcine tailings in the southem portion of the proposed interim drying facility footprint lie on the order of five (5) to seven (7) feet below the estimated average groundwater table.

3.3 Calcine Tailings

The preferred location for the interim drying facility in the area of the now dry Ponds 16/17 overlies *calcine tailings* placed during past ore processing activities on site. The process leading to the formation of the calcine tailings and what is currently known about their physical and chemical characteristics is summarized in the following paragraphs.

Formation of Calcine Tailings. Calcine tailings are formed as a byproduct of roasting of pyrite ores. *Roasting* is "the process of heating metallic sulfide ores in air to convert sulfides to oxides", typically used to create sulfuric acid. Technically, *calcination* is different from *roasting* because calcination denotes thermal decomposition as in heating limestone to drive off carbon dioxide. Nonetheless, the solid product of both types of operations is referred to as a *calcine.* The so-called *calcine tailings* south of the St. Louis Tunnel portal at Rico are not tmly tailings as would have been produced by a concentrating operation, but are simply calcine.

A plant for producing sulfuric acid from pyrite (Fe_2S) mined locally was constmcted in September 1955 and the "...acid plant ran for 9 years, until a cutback in the uranium program destroyed the market for the acid."[4] According to McKnight (1974), pyritic tailings from the lead-zinc mill were concentrated to provide feed for the first 15 months, but exhaustion of this source led to mining of massive pyrite, mostly from the mines of CHC Hill.

By the 1950s, most pyrite roasting plants used the Dorr-Oliver *Fluosolid*© apparatus that used a draft fan to suspend fine particles of pyrite in an upward-flowing stream of air. Oxygen in the air reacted with pyrite at about 600 °C as follows: $2FeS_2 + 5½O_2 = Fe_2O_3 +$

[4] *"Geology and Ore Deposits of the Rico District, Colorado", E. T. McKnight, USGS Professional Paper 723, 1974.*

$4SO_2$. The offgas from the roaster were drawn through a settling chamber, thence through dust cyclones and a wet scmbber; the mixture of wet sludge and dry particulates that were captured was *calcine*. The cleaned gases, containing about 10% SO_2, were treated in a processing unit called a contact/absorption acid plant where sulfur dioxide, SO_2, was catalytically converted to sulfur trioxide, SO_3, which was absorbed in water to create sulfuric acid, H_2SO_4. Typically, acid plants of this type produced a commercial grade of acid that contained about 93% H_2SO_4 and 7% H_2O.

Pyrite oxidizes in a roaster at a temperature too low for appreciable oxidation of the sulfides of other base metals to occur, so the calcine will typically contain chalcopyrite, galena, and sphalerite (if those minerals were present in the ore), in addition to synthetic hematite, Fc_2O_3. This is generally consistent with the analyses of mineral phases present in the Rico calcine tailings as discussed immediately below.

Physical and Chemical Characteristics of Calcine Tailings. Calcine tailings have been encountered in nine (9) test pits and seven (7) borings in the Ponds 16/17 area to date. A map and sections showing their locations are included in Appendix A and logs of these test pits and borings are presented in Appendix B. No geotechnical testing of the calcine tailings has been performed to date, but based on on-site observations and the descriptions in the logs in Appendix B they are generally described as: silty fine to very fine sand (SM); purple, maroon or red to dark red; loose to medium dense; and varying from dry to saturated depending on their location relative to the groundwater table at the site. The hydraulic conductivity of the calcine tailings has not been measured to date in the field or laboratory, but is estimated to be on the order of as high as 10^{-4} to as low as 10^{-6} cm/sec based on the above grain size description.

Selected samples of calcine tailings from borings EB-1 and EB-2 were submitted to Dr. John Drexler at the University of Colorado at Boulder for quahtative microprobe review. The samples were selected at varying depths from near surface (5-7 feet) above the water table from the middle of the deposit (10-12 feet), to the bottom of the deposit (22-24 feet) below the water table. The results of Dr. Drexler's review are presented in Appendix C. These results are summarized as follows:

1) Iron oxide was a predominant phase in most samples, consistent with the genesis of the calcine tailings as discussed above; pyrite was only observed in the deepest sample (22-24 feet).

2) Calcite is abundant in the deeper samples (below 10-12 feet).

3) Other minerals present to abundant include quartz, microcline (feldspar), sphalerite and galena; minor zinc and copper sulphate were observed in the two deepest samples (20-24 feet).

4) Gypsum is variably present in the samples; it is abundant in the two deepest samples (20-24 feet), present in minor quantities in the two shallowest samples 5-9 feet), and absent in the one mid-depth sample 10-12 feet).

The observed near neutral pH of the groundwater in the vicinity of Ponds 16/17 (see data in Appendix D) is consistent with the observation of abundant calcite in the deeper calcine

tailings samples and with previous acid neutralization testing that was performed (but for which the results have not yet been found in archival project files).

Evaluation of Potential Effects on Groundwater. Given the proposed siting of the interim solids drying facility over the calcine tailings, geochemical sampling and evaluation is proposed to assess the potential for additional release of metals due to infiltration of dewatered pore fluids from the deposited solids in the drying beds into the underlying calcine tailings, as follows:

1) Collect Shelby tube samples of calcine tailings from at least three (3) depth horizons at the approximate third points through the deposit; two of the samples would likely be above the water table with the third sample intentionally collected below the water table.

2) Collect pore fluid from treatment solids removed from Pond 18 and freshly deposited in the interim drying facility either by field extraction with a porous cup lysimeter and vacuum or by lab extraction of fluid from a bulk solids sample using a Buchner funnel.

3) Perform two suites of synthetic precipitation leaching procedures (SPLP) testing on the calcine tailings samples using two types of extracting fluids: a) pore fluid collected from the existing solids in Pond 18 to represent the anticipated leaching fluids from the interim drying facility; and b) Westem US SPLP leachate solution to simulate leaching through calcine tailings with infiltrating snowmelt/rainwater (the existing condition prior to constmcting the interim drying facility).

4) If the results of previous acid-base accounting tests on the calcine tailings are not retrievable from archival records, these tests will also be performed on the samples collected under item 1) above.

5) Additionally, samples of the calcine tailings will be collected for pH analysis.

Given the known very low driving hydraulic head of the dewatered pore fluid in the interim drying cells and the estimated low to very low permeability of the underlying calcine taihngs, it is anticipated that very litfle infiltration and permeation of the calcine tailings by the dewatered pore fluid will occur. However, testing is proposed to evaluate the potential for additional metals release in the event that some flux of solids dewatering pore fluid does occur through the calcine tailings. The proposed leaching procedures will be used to evaluate the change in pore fluids when the leaching fluid changes from the existing conditions to an alkahne dewatering fluid derived from the interim drying beds. Comparison of leaching with the two different fluids will indicate whether given constituents will increase, decrease, or remain the same if the leaching solution changes. The results of both leachate procedures can then also be compared with historic and ongoing monitoring of groundwater quality beneath and in the vicinity of the interim drying facility in existing and proposed new monitoring wells. The results of this proposed program of geochemical sampling and analysis will provide guidance for continued operation of the interim drying facility and for final design and operation of a permanent solids drying facility.

3.4 Interim Drying Facility Layout

As shown on Figure 3, the combined Ponds 16/17 area will be subdivided into several cells (four shown). Each cell will have a different design and operation that will allow for evaluation of drying technologies for a permanent facility. The cells will be set back and isolated from Ponds 18, 15 and 13 with an earthen containment dike/access road. This access would be used for solids hauling/placing, and also for future repairs/upgrades if/as needed to the existing adjacent upper pond embankments. Compacted earth dikes will be used to enclose and divide the cells, which will be sized for height to accommodate the solids removed from Pond 18 (and possibly later from the other upper ponds as necessary pending constmction of a permanent drying facility), with sufficient freeboard to accommodate direct precipitation (rainfall and snowmelt). Stormwater mn-on will be intercepted in a ditch/berm around the upslope limits of the drying facility and conveyed to the ponds system.

The Ponds 16/17 area generally consists of approximately one (1) foot of random rock fill over 15 to 25 feet of calcine tailings from historical pyrite ore processing activities. The rock fill and any other rnaterials or debris present in the footprint of the drying facility will be removed. The area of each cell will be graded to drain generally from northeast to southwest, to a sump that will be used to collect gravity-induced drainage from the placed solids that does not directly infiltrate the underlying calcine tailings (if any) and direct precipitation, which will in tum be conveyed by gravity or pumping to Pond 15 (see Figures 3 and 4).

3.5 Drying Cell Conceptual Design and Operation

It is expected that there will be four (4) cells in the interim drying facility, divided by earthen berms, with access by vehicles provided to each cell. The design of each cell varies to provide for evaluation of different drying cell procedures for the permanent drying facility design. The actual number, configuration and purpose of each of the proposed individual drying cells may change during the course of the Pond 18 solids removal based on the characteristics of the solids at the time they are removed. Adjustments to the initial layout, configuration and operation of the cells will be made, if/as necessary in response to ongoing evaluation of the removal and drying facility operations and perfomiance. The initial four (4)-cell concept is provided on Figure 3 and its construction and operation is further described as follows:

- Drying Cell 1 would consist of a perimeter dike with bottom surface graded in the existing calcine tailings. Solids would be placed directly on the calcine tailings with no underlying placed filter or drainage media. Once placed the solids would be left undisturbed until the maximum practical dewatering and consolidation by evaporation and downward drainage had occurred.
- Drying Cell 2 would be constructed and operated consistent with Cell 1, except that the solids would be periodically tilled to promote evaporative drying.
- Drying Cell 3 would include a perimeter dike with graded bottom surface on calcine tailings that is subsequently covered with a layer of gravel to provide a high efficiency drainage media to promote downward gravity drainage of pore water from the overlying solids into and then laterally through this highly permeable drainage layer. This concept would also test the tendency for the solids to "pipe" (internally

erode) into the open voids in the gravel blanket. The gravel layer would be connected to the sump at the low point of the cell.

- Drying Cell 4 would be designed and operated as for Cell 3 except that a graded soil filter would be placed between the overlying solids and the underlying gravel blanket. If the filter layer acts to prevent piping of the solids into the gravel drain, but clogs in the process, then means and methods to efficiently remove and replace the filter during operation of the facility would be evaluated.

The height of the perimeter dikes will be set to minimize to the extent practical both the depth of solids to promote more rapid and efficient drying and the plan area necessary to devote to solids drying. The footprint area and slopes of the new perimeter dikes will be set based on bearing capacity and settlement considerations of the calcine tailings foundation material, as well as stability requirements based on the nature of the embankment borrow sources (whether on- or off-site) relative to stormwater, precipitation, and seepage considerations. The drainage media (gravel layer and soil filter, where placed) will be designed based on hydraulic requirements to carry the required flows, and filter criteria to mitigate piping while maintaining adequate permeability. Details of the design and construction of the interim drying cells may vary depending on whether the solids are conveyed and placed by conventional earthmoving equipment or by suction dredge and pipeline.

4.0 Evaluation of Removal Methods and Drying Cell Performance

The means and methods utilized to remove and transport solids from Pond 18 to the interim drying facility will be thoroughly documented with field notes and digital photographs and video. The volume of solids removed and the depth of solids left in place will be tracked by survey/direct measurements (if safe access can be made) and/or load counts (if removed and transported by conventional earthmoving equipment) or pipe discharge measurement (if removed by dredge and conveyed by pipe).

The purpose of the multi-cell approach to the interim drying facility is to evaluate, on a field scale, the most efficient method(s) for dewatering and consolidation of the precipitated solids, which can then be applied, as appropriate, to future solids removal from the other upper ponds and long-term management of solids generated during operation of the overall treatment system. It is anticipated that the solids drying performance of the interim drying facility will be evaluated for key parameters using a combination of the following techniques:

- *Solids Drying Time*: Periodic measurement of the approximate depth of sediment in the drying cells, indicative of the amount and time required for consolidation. Drying will be observed throughout the initial few months after solids are placed in the drying cells, as well as possibly in 2012 for up to a year after placement.
- *Solids Physical Characteristics over Time*: Recovery of Shelby tube samples of the sediment from each cell, for laboratory evaluation of moisture content, density, shear strength, hydraulic conductivity and consolidation changes over time. These parameters will be key input data for design of the permanent drying facility and solids repository.

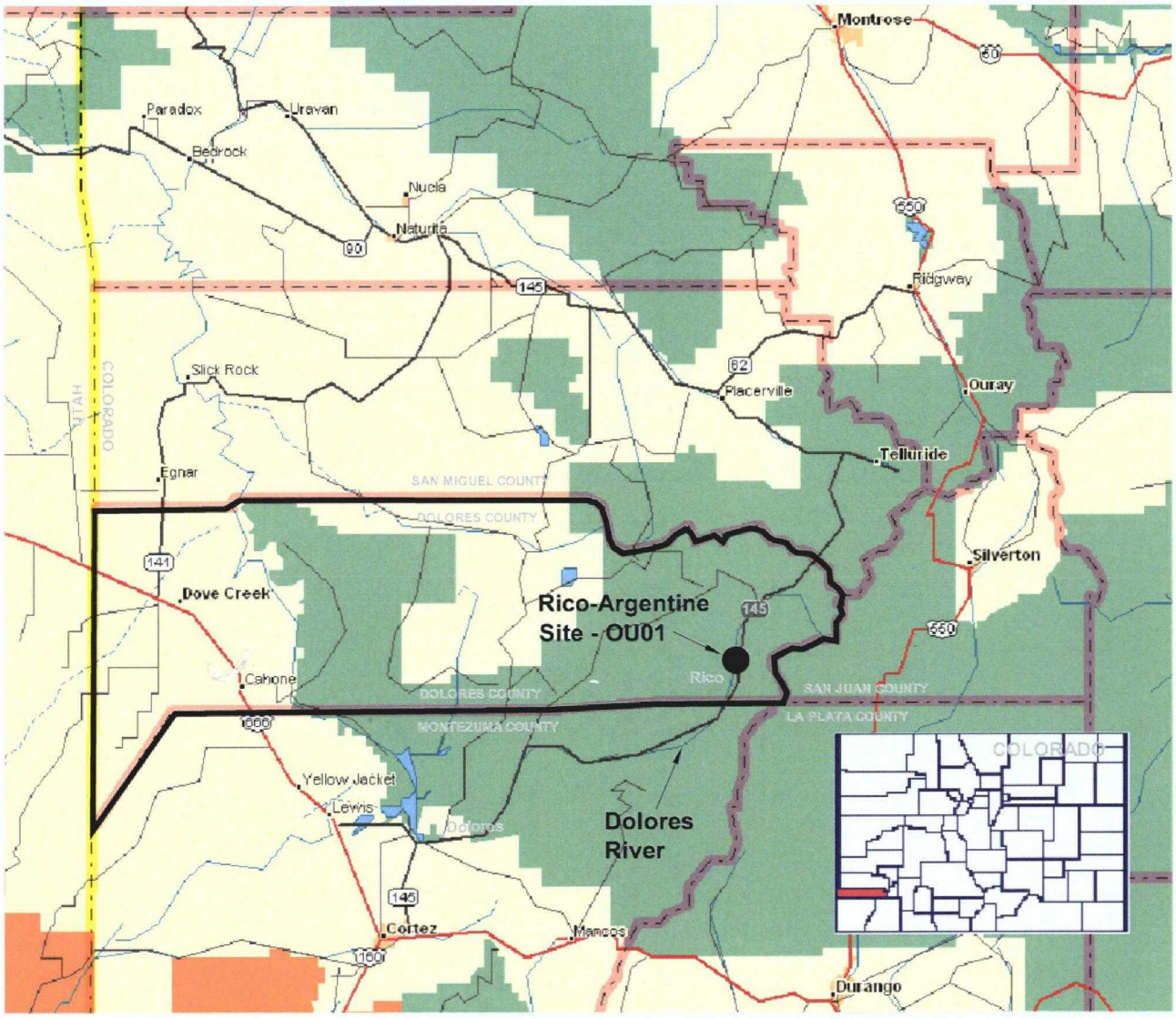
- *Drying Performance of Different Cells*: Excavation of test pits and observations of the gravel drain and earthen filter layers, where used, to assess potential for piping and clogging of these materials, and the resultant reduction in drainage efficiency and shear strength of the overlying solids.
- *Drainage Water Characterization*: Evaluation of the approximate volume and chemical characteristics of surface drainage discharged from the drying cells to Pond 15, and of potential positive or negative effects of drainage water on metals release from the underlying calcine tailings. This information will assist in imderstanding how to manage the dewatering water, and assist design of the future water treatment facilities.
- *Dust Potential and Control Options*: An ongoing assessment will also be made of the potential for dust being generated during the solids drying, and the need for control of dust from the solids. The surface of the solids in the drying cells will be treated either with a light water spray, a suitable dust suppressant, or mixed/turned over with the underlying wetter solids, if/as necessary.

5.0 Schedule and Oversight

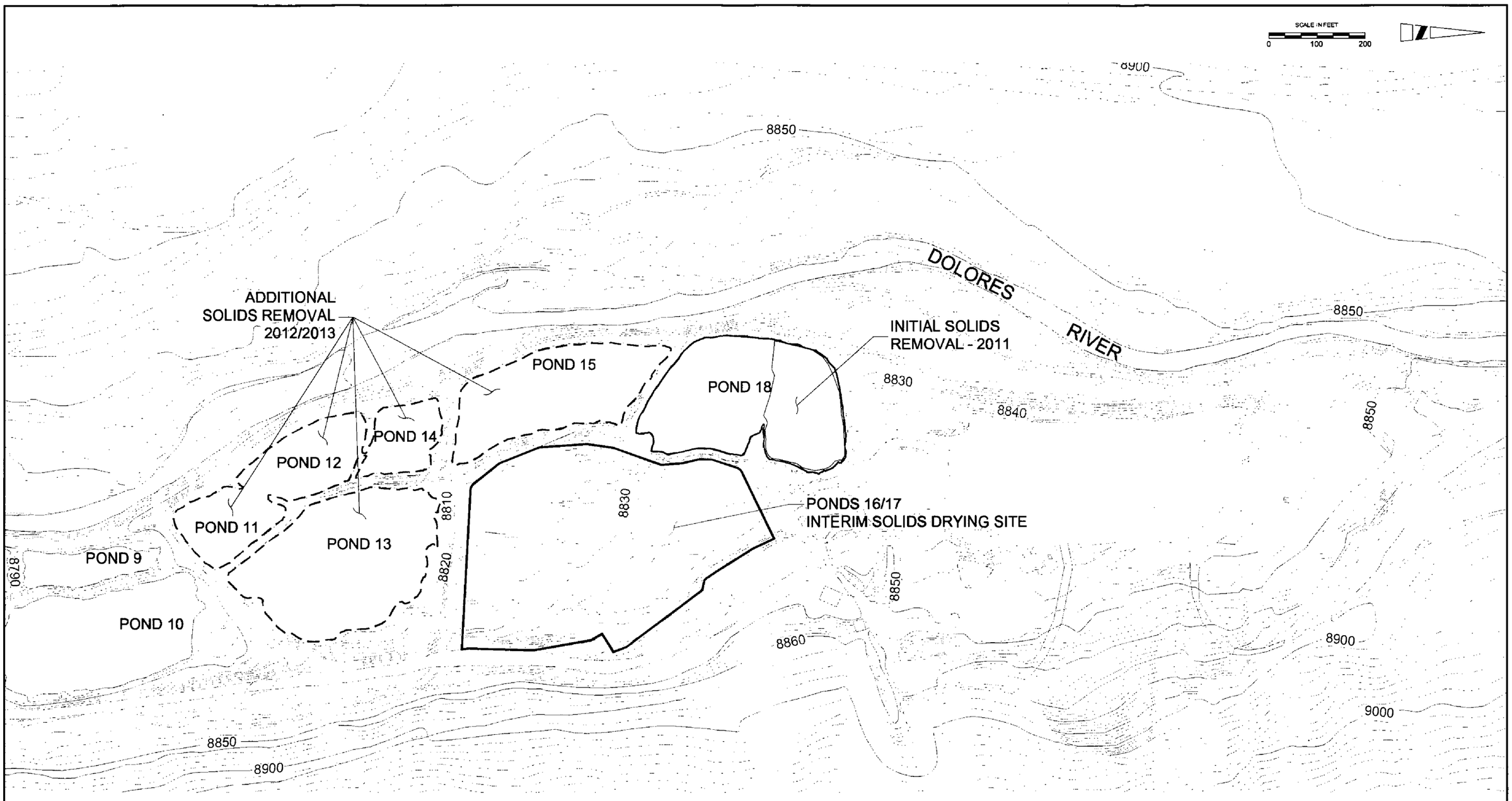
A request was made to revise the date of mobilization to the site to begin work to implement the Initial Solids Removal Plan from June 6 to the week of July 8, 2011 to allow for additional in-pond consolidation and settlement. Removal of sediment from Pond 18 will commence in mid to late summer 2011, following approval and constmction of the interim drying facility. Removal of Pond 18 solids to the interim drying facility will hkely be completed by late summer, but no later than December I, 2011. The Removal Action Work Plan schedule contemplates the solids removed from Pond 18 will be placed in a new on-site solids repository by no later than December 2013. Removal of solids from the remaining upper ponds will be performed between July 2012 and December 2013. It is anticipated that these removals will be performed as early as practical during this period to allow for the greatest degree of dewatering and consolidation of the solids as feasible. Following adequate drying, EPA's schedule projects placement of existing solids into the solids repository between July 2013 and December 2014.

The activities of selected constmction contractor(s) will be overseen by Atlantic Richfield representatives on a full-time, on-site basis. Depending on actual conditions encountered, appropriate adjustments in the sequence and/or the means and methods of removal may be identified. Any such adjustments will be presented to EPA for timely review and approval, and upon approval, implemented by the constmction contractor.

In addition to observing the quality of the work, Atlantic Richfield field oversight and design team members will also implement the activities described previously to evaluate performance of the initial removal and interim drying operations.



AECOM	RICO-ARGENTINE SITE - OU01 INITIAL SOLIDS REMOVAL PLAN	AECOM PROJECT NO.	FIGURE
AECOM Technical Services, Inc. 717 17th ST., SUITE 2600 DENVER, COLORADO 80202 T 303.228.3000 F 303.228.3001 www.aecom.com	LOCATION MAP	60157757	1



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	INITIAL SOLIDS REMOVAL AND INTERIM SOLIDS DRYING SITE	60157757	2

INITIAL SOLIDS REMOVAL - 2011

B/4

DOLORES RIVER

ADDITIONAL SOLIDS REMOVAL 2012/2013

POND 15

POND 18

8830

A/4

POND 14

POND 12

POND 11

8810

DRYING CELL #3

CONTAINMENT DIKE/ ACCESS ROAD

DRYING CELL #1

DRYING CELL #4

DRYING CELL #2

POND 13

8820

8850

POND 10

CONCEPTUAL INTERIM DRYING CELLS
- SEPARATE WITH COMPACTED EARTH DIKES
- GRADE BOTTOM TO DRAIN FROM NE to SW TO SUMP (ONE PER CELL).

8860

RUN-ON DITCH/BERM

FORMER PONDS 16/17 (CALCINE TAILINGS)

DRYING CELL	POTENTIAL ALTERNATIVE SUBGRADE PREPARATION (AFTER GRADING)
1	NONE - GRADED CALCINE TAILINGS.
2	SAME AS CELL 1, WITH ACTIVE TILLING OE PLACED SEDIMENT TO PROMOTE DRYING.
3	GRAVEL DRAINAGE BLANKET.
4	GRAVEL DRAINAGE BLANKET, WITH OVERLYING GRADED SOIL FILTER.

8850

SCALE IN FEET
0 50 100

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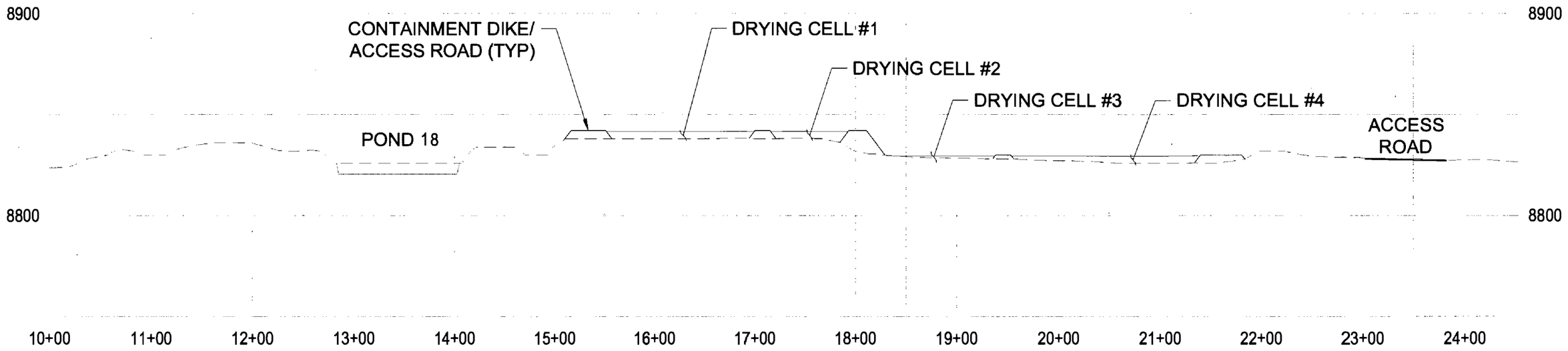
RICO-ARGENTINE SITE - OU01
INITIAL SOLIDS REMOVAL PLAN

CONCEPTUAL INTERIM
SOLIDS DRYING FACILITY PLAN

AECOM PROJECT NO.
60157757

FIGURE
3

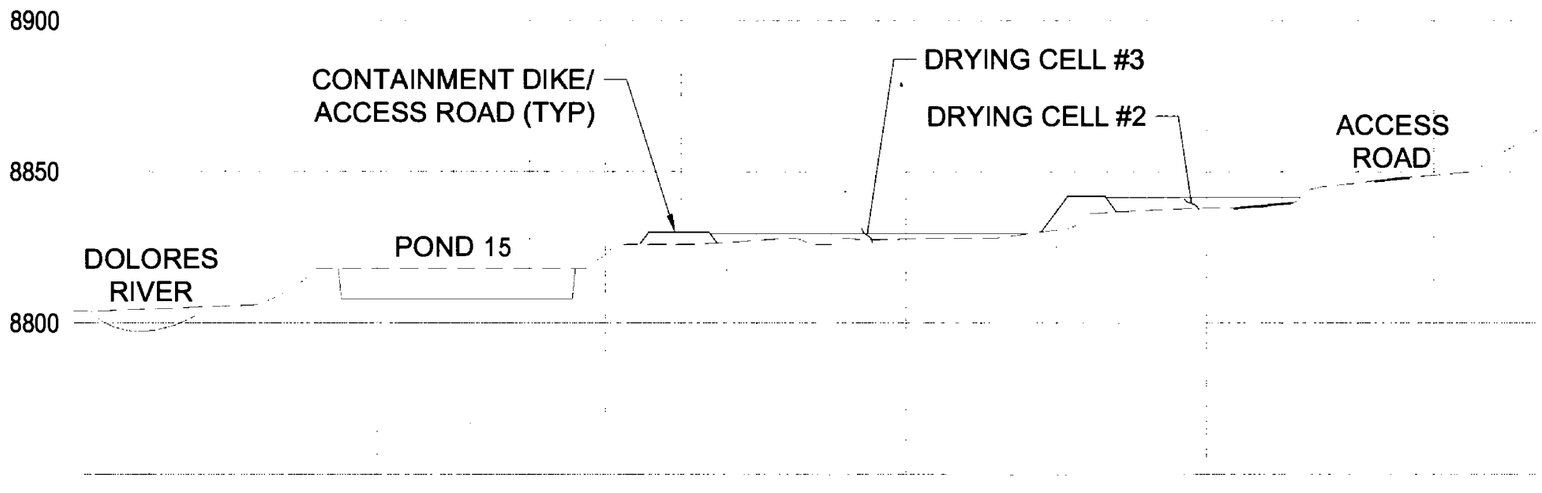


SECTION THRU CONCEPTUAL INTERIM DRYING CELLS

A

SCALE: HORIZ. 1" = 100', VERT. 1" = 50'

Vertical Scale Exaggeration - 2H:1V



SECTION THRU CONCEPTUAL INTERIM DRYING CELLS

B

SCALE: HORIZ. 1" = 100', VERT. 1" = 50'

Vertical Scale Exaggeration - 2H:1V

HORIZONTAL SCALE IN FEET
0 50 100

VERTICAL SCALE IN FEET
0 25 50

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RICO-ARGENTINE SITE - OU01
INITIAL SOLIDS REMOVAL PLAN

CONCEPTUAL INTERIM
SOLIDS DRYING FACILITY SECTIONS

AECOM PROJECT NO.
60157757

FIGURE
4

APPENDIX A
SITE GEOLOGY AND GROUNDWATER CONCEPTUAL MODEL

Rico St. Louis Ponds
Groundwater Level Measurements

Date	Groundwater Well Piezometer Levels				
	GW-4	GW-5	GW-6	GW-7	EB-2
19-Mar-11	Under Snow	21.86	Under Snow	Under Snow	16.74
15-Apr-11	9.6	19.73	19.72	20.81	15.61
19-Apr-11	9.48	19.5	21.15	20.66	15.37
26-Apr-11	9.38	19.19	20.9	20.36	15.15
3-May-11	9.42	18.95	19.12	19.91	15.1
12-May-11	14.21	18.94	19.05	19.75	19.75
18-May-11	9.33	18.7	20.39	19.61	14.84

WELLS / BORINGS

- DH-1 (ANDERSON ENGINEERING/SEH, 2008)
- EW-1, EB-1 (SEH, 2004)
- GW1 (CDPHE, 2003)
- B-1 (DAMES AND MOORE, 1981)
- EH-1 (ANACONDA MINERALS)
- DOMESTIC WELL

TEST PITS

- TP-1 (ANDERSON ENGINEERING/SEH, 2008)
- TP-2004A (SEH, 2004)
- TP-A (SEH, 2001)
- APB-1 (ANDERSON ENGINEERING, 1996)

GEOLOGIC UNITS

e	EMBANKMENT FILL, RIPRAP
f	ROAD FILL, PAVEMENT
wr	WASTE ROCK
ct	CALCINE TAILINGS
so	SPENT ORE
f/mw/d	MISCELLANEOUS FILL, MINE WASTE (TAILINGS, WASTE ROCK, ORE), BURIED DEMOLITION DEBRIS
Q_{al}	ALLUVIUM
Q_f	FAN DEPOSITS
Q_{tw}	TALUS, SLOPEWASH (COLLUVIUM)
Q_l	LANDSLIDE DEBRIS
TK_{lp}	LATITE PORPHYRY INTRUSIVES
P_{cu}	CUTLER FORMATION - SILTSTONE, ARKOSE AND CONGLOMERATE
P_{hl}	HERMOSA FORMATION (LOWER MEMBER) - SANDSTONE, SILTSTONE, SHALE, MINOR LIMESTONE OR DOLOMITE
P_l	QUARTZITE
M_l	LEADVILLE LIMESTONE
md	METADIORITE
g	GREENSTONE

SYMBOLS

- GEOLOGIC CONTACT
- BEDROCK FAULT; D * DOWN-THROWN SIDE, U * UP-THROWN SIDE
- 12 — STRIKE AND DIP OF BEDDING
- 65 — TREND AND PLUNGE OF FOLIATION
- W.L. MEASURED 6/11/11
- 6/2/09 — W.L. MEASURED ON DATE SHOWN
- W.L. DURING DRILLING/EXCAVATION

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RICO-ARGENTINE SITE - OU01
INITIAL SOLIDS REMOVAL PLAN

GEOLOGIC LEGEND

AECOM PROJECT NO
60157757

FIGURE
A1

SCALE IN FEET
0 200 400
(ORIGINAL SIZE - 11"x17")

COLORADO HWY 145

RIVER

DOLORES

UPPER NORTH ALTERNATIVE SOLIDS DRYING SITE

FUTURE SOLIDS DRYING BED BERM, TYP.

FUTURE SOUTH STACKED REPOSITORY

FUTURE NORTH STACKED REPOSITORY

ST. LOUIS TUNNEL

POND 8
POND 9
POND 10
POND 11
POND 12
POND 13
POND 14
POND 15
POND 16
POND 17
POND 18

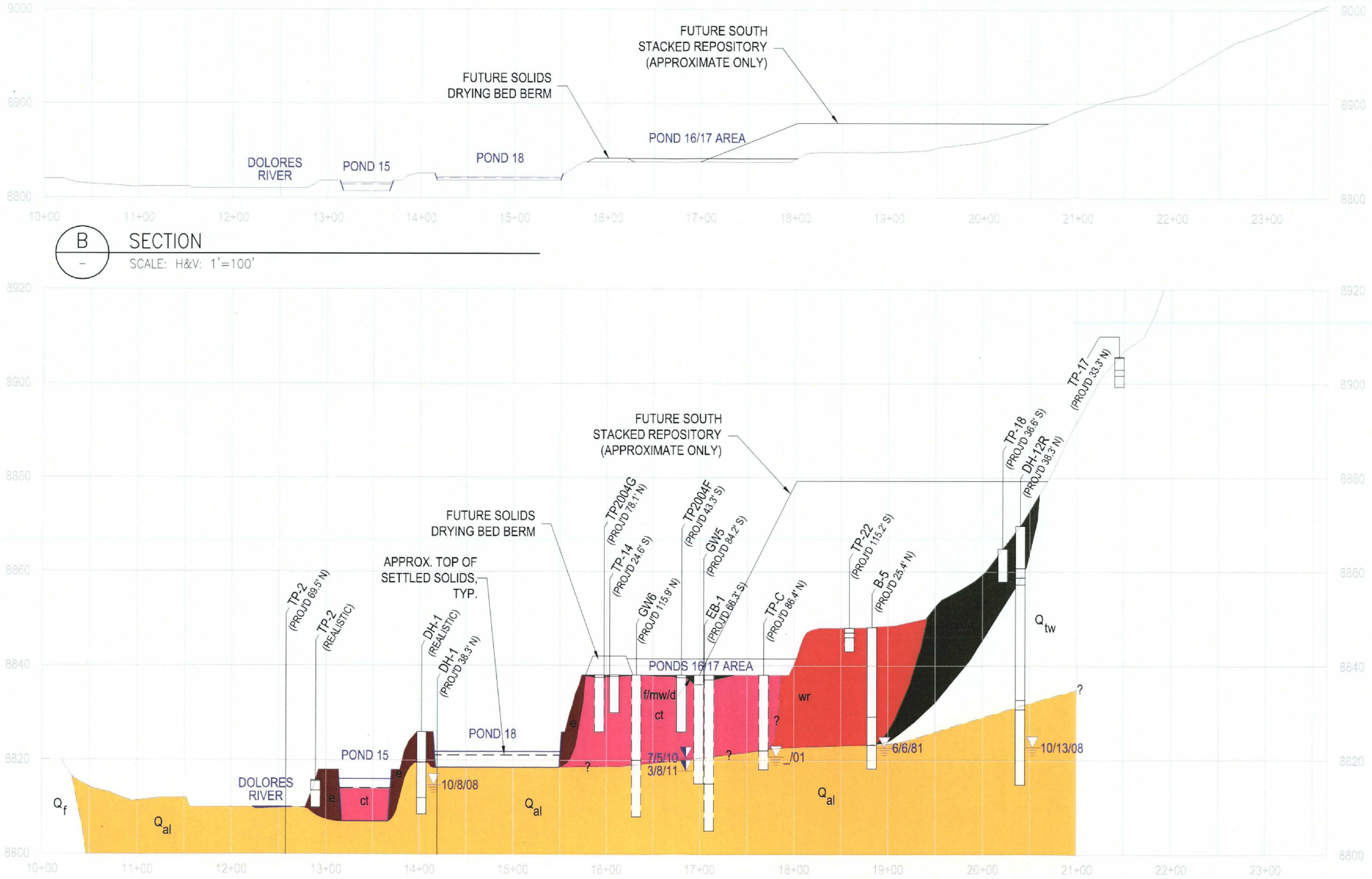
RA-GW-01
APB-1
APB-2
APB-4
EW-2A
GW1
GW2
GW3
GW4
GW5
GW6
GW7
GW8
EB-1
EB-2
EB-2D
EH-4
so
wr
ct

B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8
DH-1
DH-2
DH-3
DH-3R
DH-4
DH-5
DH-6
DH-9
DH-10
DH-11
DH-12
DH-12R
DH-13
P-15-S
P-18-S
TP-1
TP-2
TP-3
TP-4
TP-5
TP-6
TP-7
TP-8
TP-9
TP-13
TP-14
TP-15
TP-16
TP-17
TP-18
TP-19
TP-20
TP-22
TP-23
TP-24
TP-28
TP-A
TP-B
TP-C
TP2004A
TP2004B
TP2004C
TP2004D
TP2004F
TP2004G
TP2004H

Q_f Q_{al} Q_{tw} Q_l P_{hl} TK_{lp}

8850 8900 9000 9100 9200 9300

AECOM AECOM Technical Services, Inc. 717 17th ST., SUITE 2600 DENVER, COLORADO 80202 T 303.228.3000 F 303.228.3001 www.aecom.com	RICO-ARGENTINE SITE - OU01 INITIAL SOLIDS REMOVAL PLAN EXISTING EXPLORATORY LOCATIONS	AECOM PROJECT NO. 60157757	FIGURE A2



B – SECTION

SCALE: H&V: 1'=100'

B – SECTION (EXAGGERATED)

SCALE: H: 1'=100', V: 1"=20'

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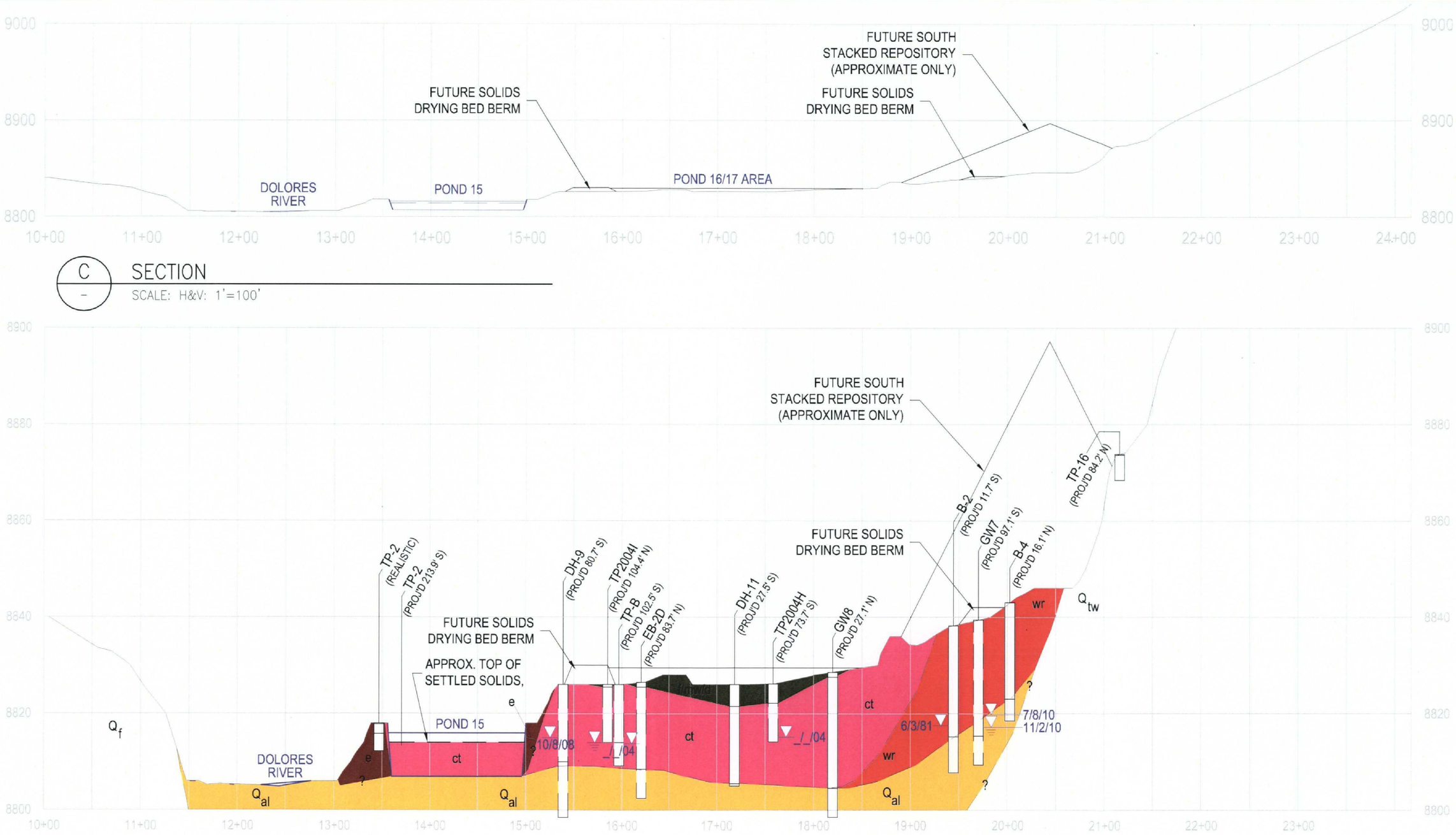
RICO-ARGENTINE SITE - OU01
INITIAL SOLIDS REMOVAL PLAN

GEOLOGIC SECTION B-B

AECOM PROJECT NO.
60157757

FIGURE
A3



C – SECTION

SCALE: H&V: 1'=100'

C – SECTION (EXAGGERATED)

SCALE: H: 1'=100', V: 1"=20'

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RICO-ARGENTINE SITE - OU01
INITIAL SOLIDS REMOVAL PLAN

GEOLOGIC SECTION C-C

AECOM PROJECT NO.
60157757

FIGURE
A4

APPENDIX B
BORING AND TEST PIT LOGS/
GEOTECHNICAL DATA

Rico-Argentine Site: Pond 16 / 17 Area - Calcine Tailings Summary

Test Pit / Boring No.	Calcine Tailings Depth, ft	Comment
TP-2004F (SEH 2004)	0.5 - 12+	Tailings extend deeper than test pit
TP-2004G	0.5 - 12+	Tailings extend deeper than test pit
TP-2004H	4 - 12+	Tailings extend deeper than test pit
TP-2004I	0 - 12+	Tailings extend deeper than test pit
TP-B (SEH 2001)	0 - 12	Sand alluvium at 12 ft
TP-C	0 - 16	Sand / gravel alluvium at 16 ft
TP-13 (Anderson 2008)	3 - 8+	Tailings extend deeper than test pit
TP-14	0.5 - 8+	Tailings extend deeper than test pit
TP-22	0 - 2	Sand / cobble alluvium at 2 ft
GW-5 (CDPHE 2002)	2 - 23+	Tailings extend deeper than boring
GW-6	0 - 18	Cobble alluvium at 18 ft
GW-8	1 - 24	Cobble alluvium at 24 ft
EB-1 (SEH 2004)	1 - 23	Sand / gravel alluvium at 23 ft
EB-2	1 - 17	Sand / gravel alluvium at 17 ft
DH-9 (Anderson 2008)	0 - 16	Sand / gravel alluvium at 16 ft
DH-11	4.5 - 20.5	Sand / gravel alluvium at 20.5 ft

Geologic/Geotechnical Data

-Well/Boring Logs

-Test Pit Logs

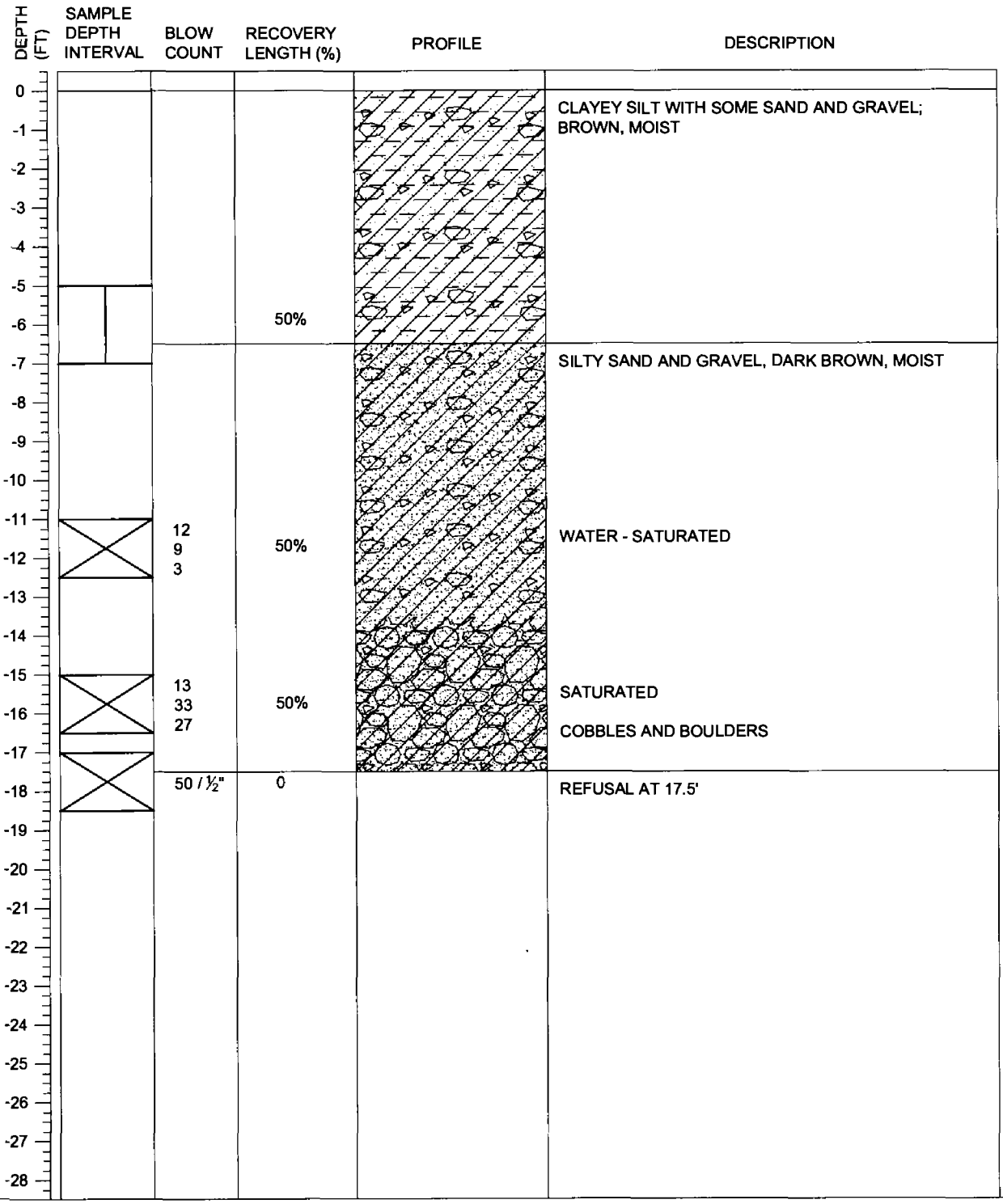
-Geotechnical Data

Well/Boring Logs

- Anderson Engineering/SEH, 2008
- SEH, 2004
- CDPHE, 2003
- Dames and Moore, 1981

BORING LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-1		COORDINATES OR LOCATION: LAT: 37.7066 LON: -108.0317
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: 11' (ENCOUNTERED) GWL DEPTH: N/A (STATIC)
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅝"	FLUID USED: N/A	DATE STARTED: 10/8/08 DATE COMPLETED: 10/8/08



TD = 17.5'

NOTES:

= SHELBY TUBE

= STANDARD SPLIT SPOON (SPT)

ANDERSON
ENGINEERING COMPANY, INC.

BORING LOG

PAGE 1 OF 1

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-2	COORDINATES OR LOCATION:	LAT: 37.7055 LON: -108.0313
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 14' GWL DEPTH: N/A	(ENCOUNTERED) (STATIC)
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅞"	FLUID USED: N/A	DATE STARTED: 10/8/08 DATE COMPLETED: 10/8/08

DEPTH (FT)	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
0 to -3					SANDY SILT, BROWN, MOIST
-3 to -5					CLAYEY SILT, MINOR SAND AND GRAVEL, RED, MOIST
-5 to -8	X	8 6 4	25%		SANDY SILT WITH GRAVEL, BROWN, MOIST
-8 to -11	X	24 4 3	0		CLAYEY SILT WITH SOME GRAVEL AND COBBLES, BROWN, MOIST
-11 to -12					RED WET SILTY SAND - CALCINE TAILINGS - NO RECOVERY-
-12 to -15	X	15 15 8	67% 50%		BROWN CLAYEY SILT WITH GRAVEL AND COBBLES, MOIST, WOOD DEBRIS, WATER DRILLING ON COBBLE, WOOD DEBRIS IN SPLIT SAMPLE
-15 to -16	X	15 14 50/3	50%		SAND AND GRAVEL, SATURATED, WITH COBBLE
-16 to -18	X	24 37	50%		SILT WITH SOME SAND AND WOOD DEBRIS, BROWN, SATURATED
-18 to -19	X	36			SAND AND GRAVEL, SATURATED WITH COBBLES DRILLING REFUSAL @ 18.5
-19 to -28					

TD = 18.5'

NOTES: TRY SHELBLY AT 5'. HIT ROCK, SWITCHED TO SPT, TOO MANY ROCKS. DROVE SPT @12' - HIT WOOD - RECOVERED ~ 1', SMELLS LIKE CREOSOTE. TRY SHELBY AT 14-16 - HIT WOOD. NOTE: COBBLES THROUGHOUT HOLE

I = SHELBY TUBE X = STANDARD SPLIT SPOON (SPT)

ANDERSON
ENGINEERING COMPANY, INC.

BORING LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-3		COORDINATES OR LOCATION: LAT: 37.7055 LON: -108.0307
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅝"	FLUID USED: N/A	DATE STARTED: 10/9/08 DATE COMPLETED: 10/9/08

DEPTH (FT)	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
0 to -10	-5 to -6	6 4 4	10%		RED SILTY SAND WITH GRAVEL, CALCINE TAILINGS
-10 to -12	-11 to -12		0%		NO RECOVERY. SHELBY PUSHED 24" THEN FREE FELL ANOTHER 12". DRILLED INTO VOID. BOTTOM OF AUGER AT 10'. TAPE MEASURED TO 16'. USED MIRROR TO LOOK INTO BORRING. CAVITY OPENS TO THE SOUTH. MOVING RIG TO ANOTHER LOCATION ~ 30' TO THE WEST.

TD = 10'

NOTES: DRILLER THOUGHT WE HIT VOID AT ~ 8'.

= SHELBY TUBE

= STANDARD SPLIT SPOON (SPT)

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ENGINEERING COMPANY, INC

BORING LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-3R	COORDINATES OR LOCATION:	LAT: 37.7054 LON: -108.0308
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 24' (ENCOUNTERED) GWL DEPTH: N/A (STATIC)	
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅝"	FLUID USED: N/A	DATE STARTED: 10/9/08 DATE COMPLETED: 10/9/08

DEPTH (FT)	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
0 to -10					SILTY SAND AND GRAVEL, BROWN
-10 to -12	-10 to -12		75%		PIECE OF OXIDIZED MINE WASTE ROCK IN TIP OF SHELBY
-12 to -15					SANDY SILT WITH CLAY, BROWN, MOIST
-15 to -17.5	-15 to -17.5	3 2 2	50%		OXIDIZED (RED/ORANGE/YELLOW) SAND WITH SOME SILT AND FINE GRAVEL. MOIST
-17.5 to -20					
-20 to -22	-20 to -21.5		60%		
-22 to -25					LT BROWN WET SANDY SILT. WATER
-25 to -25.5	-25 to -26.5	10			SATURATED COARSE SAND, GRAY
-25.5 to -28		10 10	50%		SATURATED COARSE SAND AND GRAVEL; GRAY / BROWN

TD =

NOTES: 20' SHELBY - ROCK AT BOTTOM; COMPLETELY SEALED END.

I = SHELBY TUBE ⊠ = STANDARD SPLIT SPOON (SPT)

ANDERSON
ENGINEERING COMPANY, INC.

BORING LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-3R		COORDINATES OR LOCATION: LAT: 37.7054 LON: -108.0308
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: 24' (ENCOUNTERED) GWL DEPTH: N/A (STATIC)
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅝"	FLUID USED: N/A	DATE STARTED: 10/9/08 DATE COMPLETED: 10/9/08

DEPTH (FT)	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
-29 to -57	-30 to -31	10 10 13	50%		SATURATED COARSE SAND AND GRAVEL; GRAY / BROWN
	-35 to -36	17 17 14	50%		

TD = 35'

NOTES:

I = SHELBY TUBE ⊠ = STANDARD SPLIT SPOON (SPT)

ANDERSON
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BORING LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-4	COORDINATES OR LOCATION:	LAT: 37.7042 LON: -108.0301
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 11' GWL DEPTH: N/A	(ENCOUNTERED) (STATIC)
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅝"	FLUID USED: N/A	DATE STARTED: 10/7/08 DATE COMPLETED: 10/7/08

DEPTH (FT)	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
0 to -2					SILTY SAND AND GRAVEL
-2 to -3					RED SILTY GRAVEL
-3 to -8	-5 to -7	6 4 4	50%		SILTY SAND WITH GRAVEL, MINOR CLAY
-8 to -9					BLACK SILT WITH CLAY
-9 to -12	-10 to -12	4 3 2	75%		CLAYEY GRAVEL WATER
-12 to -18	-15 to -17	0 4 8	75%		SILTY GRAVEL WITH CLAY SATURATED GRAY / DK BROWN SILTY CLAY
-18 to -20					SATURATED - DK BROWN FLOWING SILT
-20 to -28	-21 to -22	50 / 4"	30%		SILTY SAND AND GRAVEL, DK BROWN

TD = 20.5'

NOTES:

I = SHELBY TUBE

⊠ = STANDARD SPLIT SPOON (SPT)

ANDERSON
ENGINEERING COMPANY, INC

BORING LOG

PAGE 1 OF 1

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-5	COORDINATES OR LOCATION:	LAT: 37.7039 LON: -108.0305
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 11' GWL DEPTH: N/A	(ENCOUNTERED) (STATIC)
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅞"	FLUID USED: N/A	DATE STARTED: 10/7/08 DATE COMPLETED: 10/7/08

DEPTH (FT)	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
0 to -5					SILTY SAND AND SOME GRAVEL
-5 to -10					SANDY GRAVEL AND SILT
-5 to -10	-5 to -6.5	4 10 6	25%		SANDY SILT WITH GRAVEL
-10 to -14	-10 to -11.5	3 5 4	1%		HIT ROCK - NO SAMPLE RECOVERY
-14 to -18					SATURATED SILT WITH SOME MINOR SMALL GRAVEL
-18 to -22					SILTY SAND AND GRAVEL, SATURATED
-20 to -21	-20 to -21	24/6 50/6	25%		
-22 to -28					COBBLES - REFUSAL @ 23'

TD = 23'

NOTES:

I = SHELBY TUBE

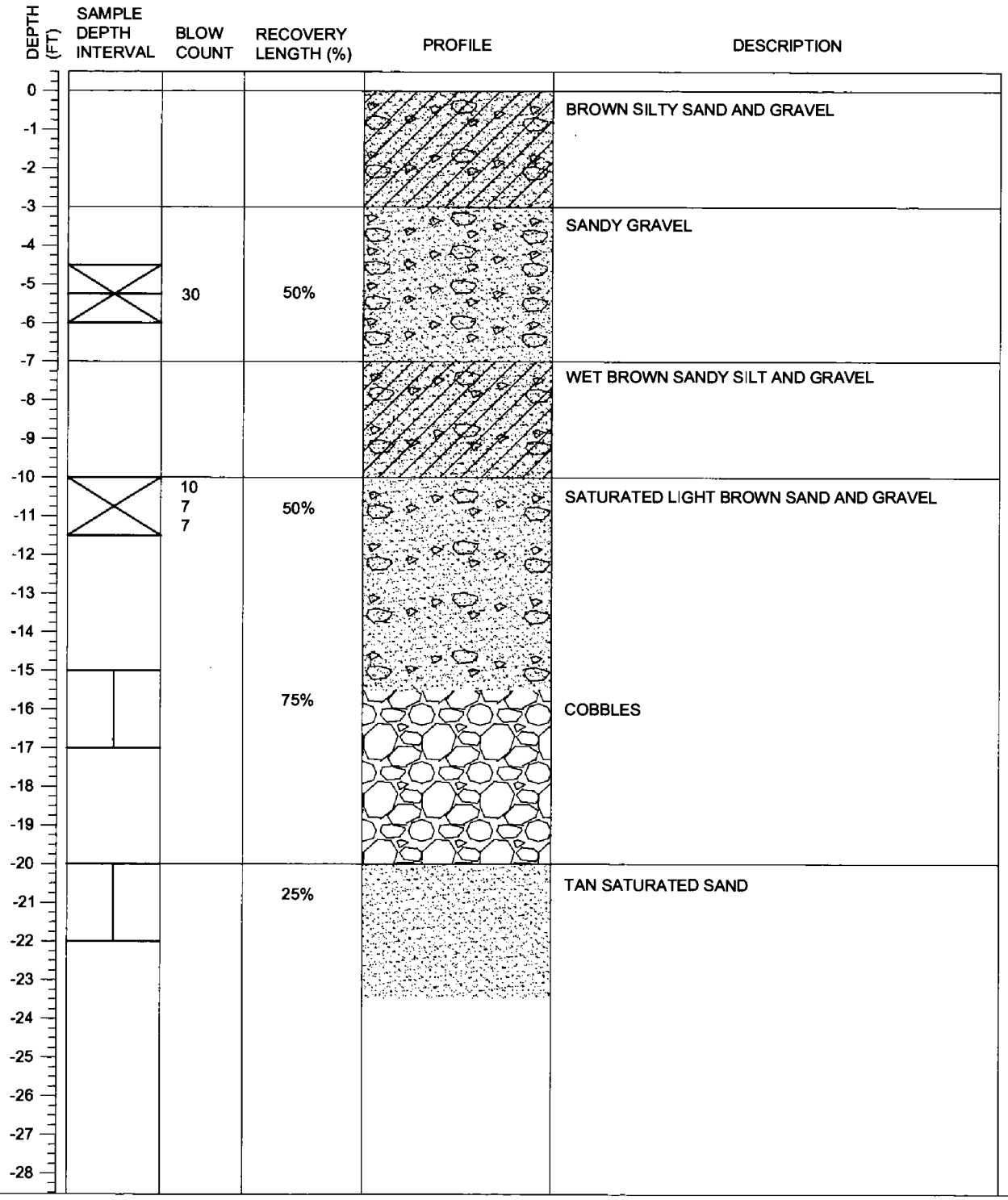
⊠ = STANDARD SPLIT SPOON (SPT)

ANDERSON
ENGINEERING COMPANY, INC

BORING LOG

PAGE 1 OF 1

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-6	COORDINATES OR LOCATION:	LAT: 37.7027 LON: -108.0305
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 10' GWL DEPTH: N/A	(ENCOUNTERED) (STATIC)
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅝"	FLUID USED: N/A	DATE STARTED: 10/7/08 DATE COMPLETED: 10/7/08



TD = 25'

NOTES: ATTEMPTED SHELBY @ 15'. ROCK IN AUGER. SHELBY DESTROYED WITH NO SAMPLE RECOVERY. PUSHED OUT PLUG WITH CENTER PUNCH.

= SHELBY TUBE

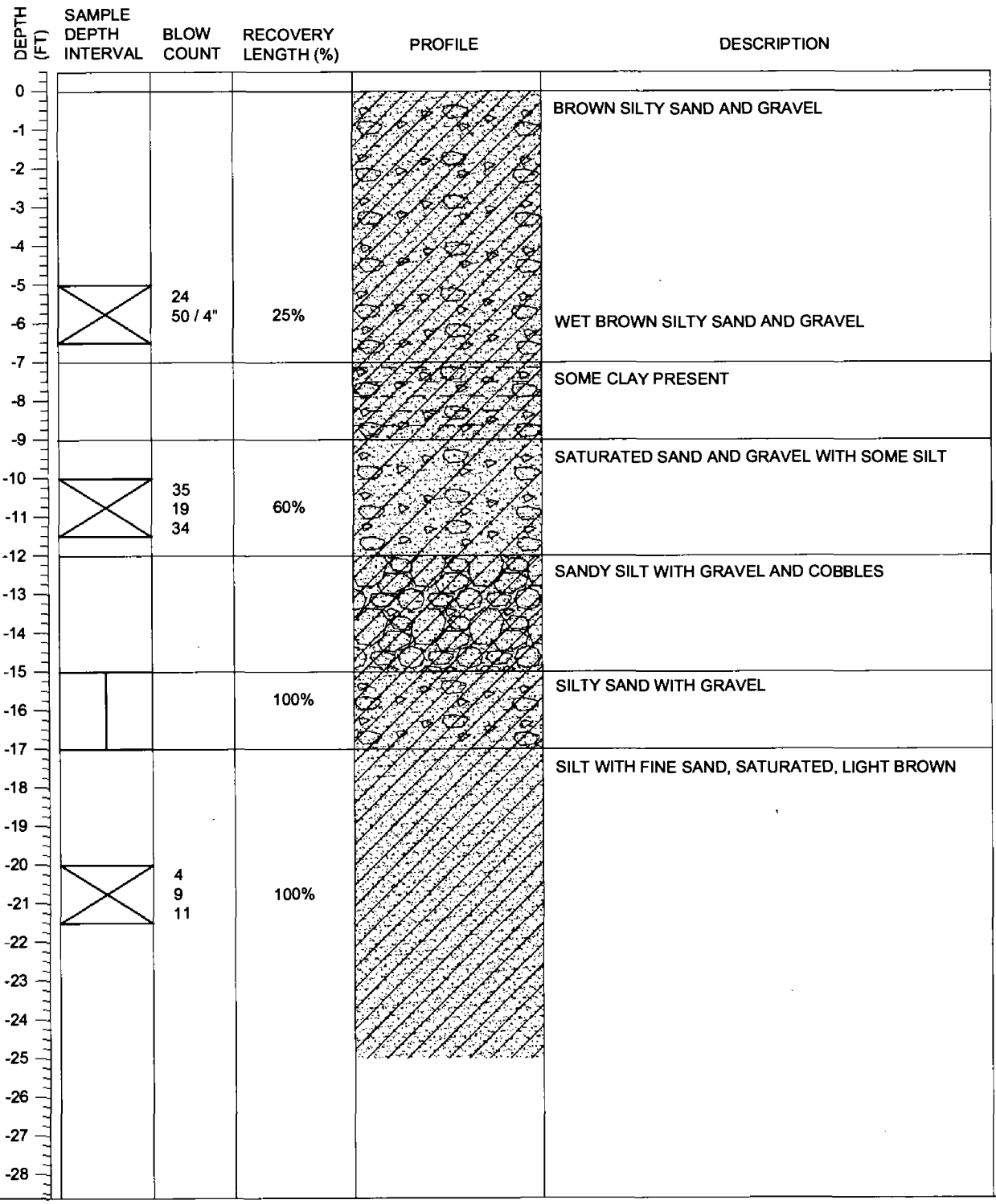
= STANDARD SPLIT SPOON (SPT)

= CALIFORNIA SPLIT SPOON

ANDERSON
ENGINEERING COMPANY, INC

BORING LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-7	COORDINATES OR LOCATION:	LAT: 37.7018 LON: -108.0299
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 10 GWL DEPTH: N/A	(ENCOUNTERED) (STATIC)
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅝"	FLUID USED: N/A	DATE STARTED: 10/9/08 DATE COMPLETED: 10/9/08



TD = 21.5'

NOTES:

= SHELBY TUBE = STANDARD SPLIT SPOON (SPT)

ANDERSON
ENGINEERING COMPANY, INC.

BORING LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-8	COORDINATES OR LOCATION:	LAT: 37.7008 LON: -108.0301
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 6 GWL DEPTH: N/A	(ENCOUNTERED) (STATIC)
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅝"	FLUID USED: N/A	DATE STARTED: 10/9/08 DATE COMPLETED: 10/9/08

DEPTH (FT)	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
0 to -7	-5 to -7	9 8 29	50%		SILTY SAND AND GRAVEL, BROWN WATER, SATURATED
-7 to -12	-11 to -12	21 30 20	50%		SATURATED BROWN SANDY SILT WITH GRAVEL COBBLES AND BOULDERS REFUSAL @ 12'

TO = 12'

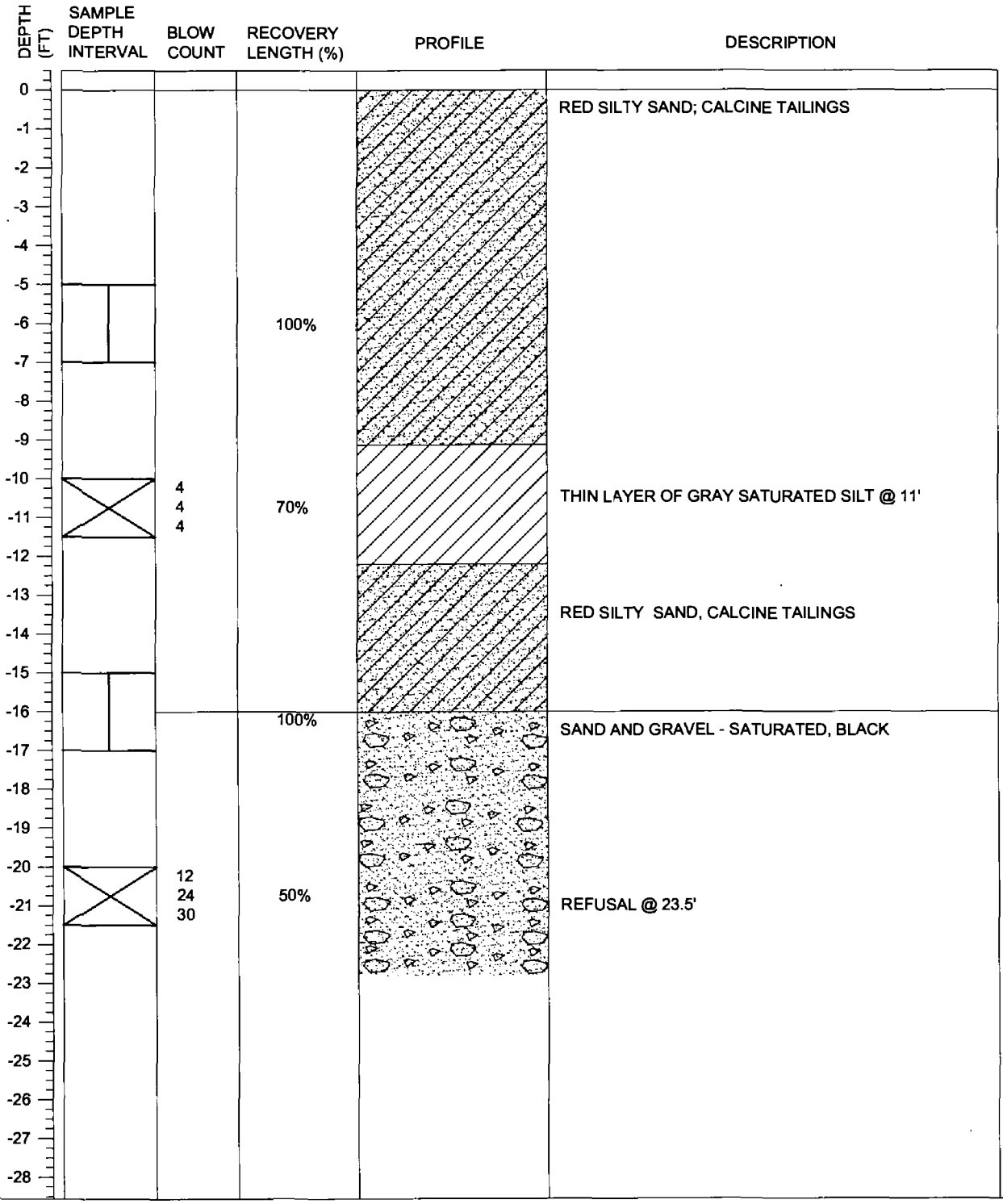
NOTES:

I = SHELBY TUBE ⊠ = STANDARD SPLIT SPOON

ANDERSON
ENGINEERING COMPANY, INC.

BORING LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-9		COORDINATES OR LOCATION: LAT: 37.7062 LON: -108.0314
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: ~ 17' (ENCOUNTERED) GWL DEPTH: N/A (STATIC)
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅝"	FLUID USED: N/A	DATE STARTED: 10/8/08 DATE COMPLETED: 10/8/08



TD = 23.5'

NOTES:

= SHELBY TUBE = STANDARD SPLIT SPOON

ANDERSON
ENGINEERING COMPANY, INC

BORING LOG

PAGE 1 OF 1

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-10	COORDINATES OR LOCATION: LAT: 37.7046 LON: -108.0308
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: ~ 13' (ENCOUNTERED) GWL DEPTH: N/A (STATIC)
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅝" / FLUID USED: N/A	DATE STARTED: 10/7/08 DATE COMPLETED: 10/7/08

DEPTH (FT)	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
0 to -4					BROWN SILTY SAND AND GRAVEL
-4 to -13	-5 to -7 -9 to -11		<25% 33%		BROWN CLAYEY SILT WITH MINOR GRAVEL
-13					SATURATED DARK BROWN - GRAY SILT WITH MINOR GRAVEL
-14 to -17	-14 to -16	10 26 50 / 2	<25%		SATURATED BROWN SAND AND GRAVEL, SOME MINOR SILT ROCK ENCOUNTERED AT 17' REFUSAL @ 17'

TD = 17'

NOTES:

I = SHELBY TUBE ⊠ = STANDARD SPLIT SPOON (SPT)

ANDERSON
ENGINEERING COMPANY, INC.

BORING LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-11		COORDINATES OR LOCATION: LAT: 37.7063 LON: -108.0308
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: ~ 20 (ENCOUNTERED) GWL DEPTH: N/A (STATIC)
DRILLING METHOD: HOLLOW STEM AUGER	HOLE DIA: 7⅝"	FLUID USED: N/A	DATE STARTED: 10/8/08 DATE COMPLETED: 10/8/08

DEPTH (FT)	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
0 to -4			70%		BROWN CLAYEY SILT, MOIST MINOR GRAVEL
-5 to -16			100% / 100% / 100% / 100%		RED SILTY SAND, CALCINE TAILINGS
-17 to -19			100%		RED SILT - CALCINE TAILINGS
-20 to -21		27 50 / 1"	50%		SAND AND GRAVEL, SATURATED RED / BROWN WITH COBBLES REFUSAL @ 21'
-22 to -28					

TD = 21'

NOTES: ATTEMPTED SHELBY @ 10'; 0 RECOVERY

I = SHELBY TUBE ⊠ = STANDARD SPLIT SPOON (SPT)

ANDERSON
ENGINEERING COMPANY, INC.

BORING LOG

PAGE 1 OF 2

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-12R	COORDINATES OR LOCATION:	LAT: 37.7073 LON: -108.0297
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 43' GWL DEPTH: N/A	(ENCOUNTERED) (STATIC)
DRILLING METHOD: ODEX	HOLE DIA: 6"	FLUID USED: AIR	DATE STARTED: 10/13/08 DATE COMPLETED: 10/13/08

DEPTH (FT)	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
0 to -5					BROWN SANDY SILT WITH SOME CLAY AND GRAVEL
-5 to -9					BROWN CLAYEY SILT WITH SOME SAND AND SMALL GRAVEL
-9 to -11					ROCK
-11 to -13					RED SILTY SAND WITH GRAVEL, CALCINE TAILINGS
-13 to -22	-13 to -14	6 4 4	50%		BROWN SANDY SILT WITH SOME CLAY AND GRAVEL
-22 to -28					BROWN SANDY SILT WITH GRAVEL

TD =

NOTES:

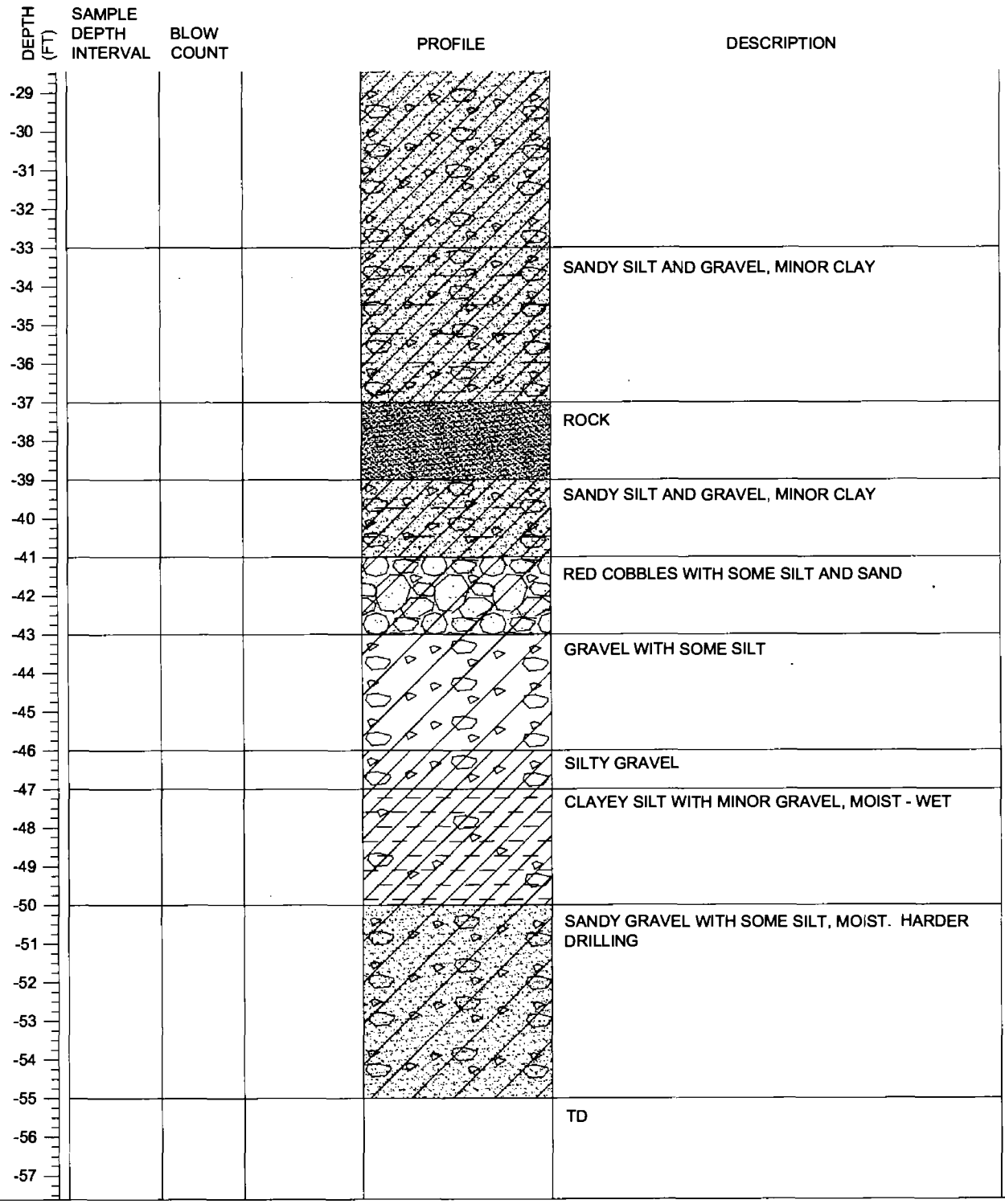
I = SHELBY TUBE

X = STANDARD SPLIT SPOON (SPT)

ANDERSON
ENGINEERING COMPANY, INC.

BORING LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-12R	COORDINATES OR LOCATION:	LAT: 37.7073 LON: -108.0297
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 43' GWL DEPTH: N/A	(ENCOUNTERED) (STATIC)
DRILLING METHOD: ODEX	HOLE DIA: 6"	FLUID USED: AIR	DATE STARTED: 10/13/08 DATE COMPLETED: 10/13/08



TD = 55'

NOTES: SOME GRAVEL IS CRUSHED ROCK FROM ODEX HAMMER HIT. UNKNOWN ORIGINAL SIZE.

= SHELBY TUBE = STANDARD SPLIT SPOON (SPT)

ANDERSON
ENGINEERING COMPANY, INC.

BORING LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-13	COORDINATES OR LOCATION:	LAT: 37.7033 LON: -108.0305
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 8' GWL DEPTH: N/A	(ENCOUNTERED) (STATIC)
DRILLING METHOD: ODEX	HOLE DIA: 6"	FLUID USED: AIR	DATE STARTED: 10/13/08 DATE COMPLETED: 10/13/08

DEPTH (FT)	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
0 to -5					BROWN SILT AND SAND WITH SOME GRAVEL
-5 to -7					WOOD DEBRIS
-7 to -9					SILTY SAND AND GRAVEL, MOIST, BROWN
-9 to -16					SATURATED SILTY SAND AND GRAVEL, BROWN
-16 to -18					SATURATED LIGHT BROWN SILTY GRAVEL
-18 to -28					SATURATED LIGHT BROWN SILTY SAND GRADES MORE SILTY

TD =

NOTES:

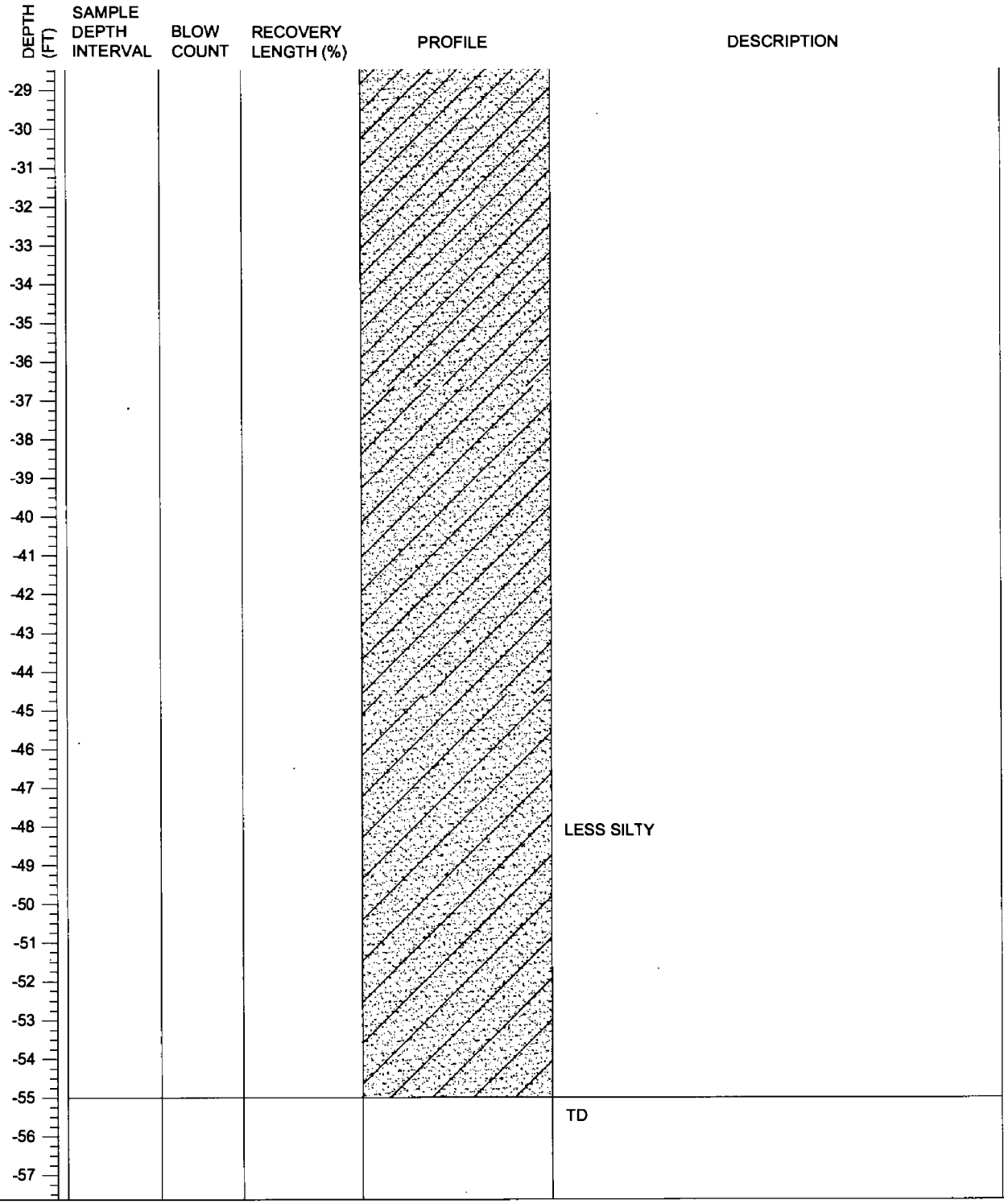
I = SHELBY TUBE

⊠ = STANDARD SPLIT SPOON (SPT)

ANDERSON
ENGINEERING COMPANY, INC.

BORING LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: DH-13	COORDINATES OR LOCATION:	LAT: 37.7033 LON: -108.0305
LOGGED BY: K. COSPER CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 8' GWL DEPTH: N/A	(ENCOUNTERED) (STATIC)
DRILLING METHOD: ODEX	HOLE DIA: 6"	FLUID USED: AIR	DATE STARTED: 10/13/08 DATE COMPLETED: 10/13/08



TD = 55'

NOTES:

= SHELBY TUBE

= STANDARD SPLIT SPOON (SPT)

ANDERSON
ENGINEERING COMPANY, INC

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
St. Louis Ponds Area, Rico, Colorado	AARCOE0105.00	EW-1

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jeff Pennell Layne-Western	11/20/2004	11/21/2004	odex

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		EW-1	Feet Site	8,850.5 Feet Site	5.0 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐
State Plane N, E S/C/N
NW 1/4 of NW 1/4 of Section 25, T 40 N, R 10 W
Lat ° ' "
Long ° ' "
Local Grid Location ☒ N 1389193 Feet ☐ S ☒ E 2268176 Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
			Rico, Colorado

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24	17-20 15-11	2	FILL: Brown, dense, GRAVELLY SAND, some organics in surface soils.					35					Note: Compressive Strength = SPT N value
2 SS	24	5-7 7-7	4	Brown, medium dense, fine to coarse grained CLAYEY SAND, with gravel.	SC				14					Note: Length att. on split spoon = 24"
3 SS	24	5-11 5-2	6						16					
4 SS	24	4-4 6-3	8	Brown, loose, fine to coarse grained, CLAYEY SAND.	SC				10					
5 SS	24	2-8 4-5	10	Brown, loose to very dense, fine to coarse grained, CLAYEY SAND and gravel					12					
1 SH 6 SS	6 24	5-4 2-4	12 14						6					approx. 6 inches recovery
2 SH	24		16		SC									
7 SS	24	6-8 10-8	18						18					
			20											
8 SS	24	50	22 24	Brown-gray, very dense, fine-coarse GRAVEL, with sand and clay	GP				50					

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Daniel R. Reed
Firm: **SEH Inc** 421 Frenette Drive, Chippewa Falls, WI 54729, www.sehinc.com
Tel: 715.720.6200
Fax: 715.720.6300

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT

Form 4400-122A

Boring Number EW-1 Use only as an attachment to Form 4400-122.

Sample										Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			26	Brown-gray, very dense, fine-coarse GRAVEL, with sand and clay	GP									
			28	End of boring at 28' (refusal)										

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
St. Louis Ponds Area, Rico, Colorado	AARCOE0105.00	EW-2A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jeff Pennell Layne-Western	11/21/2004	11/21/2004	odex

Wt Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet Site	8,846.4 Feet Site	5.0 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐
State Plane N, E S/C/N
NW 1/4 of NW 1/4 of Section 25, T 40 N, R 10 W
Lat ° ' "
Long ° ' "
Local Grid Location ☒ N 1389198 Feet ☐ S ☒ E 2268004 Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
			Rico, Colorado

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24	1-3 12-9	2	FILL: Brown, dense, GRAVELLY SAND, some organics in surface soils.					15					Note: Compressive Strength = SPT N value
2 SS	24	3-7 4-5	4	Brown, loose, fine to coarse grained CLAYEY SAND, with gravel.	SC				11					Note: Length an. on split spoon = 24"
3 SS	24		6	Brown, loose, SANDY CLAY to clayey sand, with gravel.	CL									
4 SS	24	3-4 3-3	8	Brown, medium stiff, SANDY CLAY, with gravel	CL-ML				7					
5 SS	24	5-8 8-17	10	Brown, stiff, SANDY CLAY to clayey sand, with gravel	CL-ML				16					
			12	End of boring at 12' (abandoned)										

I hereby certify that the infontiation on this form is true and correct to the best of my knowledge.

Signature Donald R. Reed Firm **SEH Inc** 421 Frenette Drive Chippewa Falls, WI 54729 www.sehinc.com Tel: 715.720.6200 Fax: 715.720.6300

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
St. Louis Ponds Area, Rico, Colorado	AARCOE0105.00	EB-1

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jeff Pennell Layne-Western	11/15/2004	11/18/2004	hsa/odex

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		EB-1	8,820.9 Feet Site	8,837.9 Feet Site	8.0 inches

Local Grid Origin ☒ (estimated ☐) or Boring Location ☐
State Plane N, E S/C/N
NW 1/4 of NW 1/4 of Section 25, T 40 N, R 10 W
Lat ° ' "
Long ° ' "
Local Grid Location ☒ N 1388792 Feet ☐ S ☒ E 2267917 Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
			Rico, Colorado

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24	29-44 18-14	0	FILL: Gray, very dense, WASTE ROCK, igneous cobbles					62					Note: Compressive Strength = SPT N value
2 SS	24	5-8 8-12	2	FILL ("Calcine Tailings"): Purple-maroon to gray, loose to medium dense, fine to very fine grained, SILTY SAND, rare gravel					16					Note: Length att. on split spoon = 24"
3 SS	24	4-9 8-11	4						17					
4 SS	24	5-5 7-7	6						12					
1 SH	24		8											
2 SH	24		10											
4 SS	24	5-4 4-3	12		SM				8					
3 SH	24		14											
5 SS	24	2-2 6-16	16						8					
4 SH	24		18											
6 SS	24	12-7 9-7	20						16					
5 SH	24		22											
			24		GP									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Darrell R. Reed Firm: SEH Inc 421 Frenene Drive Chippewa Falls, WI 54729 www.sehinc.com Tel: 715.720.6200 Fax: 715.720.6300

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number EB-1 Use only as an attachment to Form 4400-122.

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			26	Brown, dense, fine to coarse GRAVEL (alluvium), much fine to coarse grained sand.										
7 SS	24	22-20 24-50	28		GP				44					
			30											
			32											
				End of boring at 33' (refusal)										

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
St. Louis Ponds Area, Rico, Colorado	AARCOE0105.00	EB-2

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jeff Pennell Layne-Western	11/19/2004	11/19/2004	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		EB-2	8,818.8 Feet Site	8,826.8 Feet Site	8.0 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐
State Plane N, E S/C/N
NW 1/4 of NW 1/4 of Section 25, T 40 N, R 10 W
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
			Rico, Colorado

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24	4-6 4-7	2	FILL: Gray, very dense, WASTE ROCK, igneous cobbles FILL("Calcine Tailings"): Purple-maroon to gray, loose to medium dense, fine to very fine grained, SILTY SAND, rare gravel	SM				10					Note: Compressive Strength = SPT N value Note: Length att. on split spoon = 24"
2 SS	24	4-4 5-4	4						9					
3 SS	24	3-3 6-3	6						9					
4 SS	24	3-2 1-1	8						3					
			10											
			12											
5 SS	24	1-1 1-1	14						2					
			16											
			18	Brown, dense, fine to coarse GRAVEL (alluvium), much fine to coarse grained sand.	GP									
6 SS	24	12-24 50	20						74					
			22											
			24	End of boring at 24'										

I hereby certify that the infonnation on this form is true and correct to the best of my knowledge.

Signature: Daniel R. Reed Firm: SEH Inc 421 Frenette Drive Chippewa Falls, WI 54729 www.sehinc.com Tel: 715.720.6200 Fax: 715.720.6300

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Fonn 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
St. Louis Ponds Area, Rico, Colorado	AARCOE0105.00	EB-2D

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jeff Pennell Layne-Western	11/18/2004	11/19/2004	odex

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet Site	8,826.0 Feet Site	5.0 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐
State Plane N, E S/C/N
NW 1/4 of NW 1/4 of Section 25, T 40 N, R 10 W
Lat ° ' "
Long ° ' "
Local Grid Location ☒ N ☒ E
1388306 Feet ☐ S 2267920 Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
			Rico, Colorado

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0	FILL: Gray, very dense, WASTE ROCK, igneous cobbles										
			2	FILL ("Calcine Tailings"): Purple-maroon to gray, loose to medium dense, fine to very fine grained, SILTY SAND, rare gravel										
1 SH	24		4											Note: Compressive Strength = SPT N value Note: Length att. on split spoon = 24" 3" diameter split spoon used (no shelby rec)
2 SH	24		6											
1 SS	24		8											
3 SH	24		10		SM									
4 SH	24		12											
			14											
2 SS	24	4-1 1-4	16						2					
			18	Brown, dense, fine to coarse GRAVEL (alluvium), much fine to coarse grained sand.										
			20		GP									
			22											
			24											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Darrell R. Reed

Firm: SEH Inc 421 Frenche Drive Chippewa Falls, WI 54729 www.sehinc.com
Tel: 715.720.6200
Fax: 715.720.6300

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT

Form 4400-122A

Boring Number EB-2D Use only as an attachment to Form 4400-122.

Sample									Soil Properties						
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				End of boring at 24' (abandoned - moved to EB-2, approx. 10' to east)										

CDPHE

WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Project Number: Rico Light Industrial Park	Project Name: Rico Light Industrial Park
Well Number: RLP-GW1	Well Location: Rico Light Industrial Park

Time / Date:	10/16/02	Elevation :	8,800 msl
Drilling Method:	4-Inch Hollow Stem Auger	Weather:	Clear Skies, Partly Sunny 60°F
Development Company:	Kaycnta Consulting		Slight Breeze
Date Development Started:	10/16/02	Date Development Completed:	10/16/02
Screen Intervals: 4ft. To 9 ft bes		Well Diameter:	2 Inch
Depth of Well (L"):	9 ft.	Depth to Water Before Development (L'):	6.5 ft
Height of Water Column (L" - L'):	6 ft.		
Depth to Top of Sediment (L')	9 fl.	Sediment Thickness (L" - L'):	Na ft
Well Volume:	0.96 gal.		
Total Volume Pumped:	30 gal.		
Number of Well Volumes Pumped	(total volume pumped/well volume):	30+ volumes pumped on 10/16/02	0.16 galloos per foot on a 2-Inch Well

Monitoring Well Sample Data : Well RLP-GW1

Date	Temp	pH	Csnd	Gallons Parged	Observations
10/16/02	11.2	7.37	359	27	Slightly turbid
10/16/02	10.8	7.36	359	29	Clear, Slightly tmbid

* Sample collection cootinued after well development includes well development purge voknncs

10/16/02 @ 1345 — Sample Collected

Lithology

0-9 feet	Native rocky cobble material

Presented By	Date	Checked By	Date

CDPHE

WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Project Number: Rico Light Industrial Park	Project Name: Rico Light Industrial Park
Well Number: RLP-GW2	Well Location: Rico Light Industrial Park

Time / Date:	10/16/02	Elevation :	8,800 msl
Drilling Method:	4-Inch Hollow Stem Auger	Weather:	Clear Skies, Partly Sunny 60°F
Development Company:	Kaventa Consulting		Slight Breeze
Date Development Started:	10/16/02	Date Development Completed:	10/16/02
Screen Intervals: 10.5 ft. To 20.5 ft bgs		Well Diameter:	2 Inch
Depth of Well (L"):	20.5 ft.	Depth to Water Before Development (L'):	6.5 ft
Height of Water Column (L" - L'):	2.0 ft.		
Depth to Top of Sediment (L')	20.5 ft.	Sediment Thickness (L" - L'):	Na ft.
Well Volume:	0.32 gal.		
Total Volume Pumped:	5 gal.		
Number of Well Volumes Pumped	(total volume pumped/well volume):	4x volumes pumped on 10/16/02	0.16 gallons per foot on a 2-Inch Well

Monitoring Well Sample Data : Well RLP-GW2

Date	Temp	pH	Good	Gallons Purged	Observations
10/16/02	11.9	7.29	1004	Purged dry four times	Clear
				Total of 5 gallons max	

* Sample collection continued after well development includes well development purge volumes

10/16/02 @ 1620 — Sample Collected

Lithology

0-12 feet	Spent pyretic ore with mixed coble and rock. Ore materials are green and purple in color. Leach pad liner at 12 feet bgs
12-20.5 feet	Native rocky cobble material

Presented By	Date	Checked By	Date

CDPHE

WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Project Number: Rico Light Industrial Park	Project Name: Rico Light Industrial Park
Well Number: RLP-GW3	Well Location: Rico Light Industrial Park

Time / Date:	10/16/02	Elevation :	8,800 msl
Drilling Method:	4-Inch Hollow Stem Auger	Weather:	Clear Skies, Fartly Sunny 60°F
Development Company:	Kaventa Consulting		Slight Breeze
Date Development Started:	10/16/02	Date Development Completed:	10/16/02
Screen Intervals: 7 ft. To 16.5 ft bgs		Well Diameter:	2 Inch
Depth of Well (L^w):	16.5 ft.	Depth to Water Before Development (L^l):	6.5 ft.
Height of Water Column (L^w - L^l):	9.5 ft.		
Depth to Top of Sediment (L^l)	16.5 ft.	Sediment Thickness (L^w - L^l):	Na ft.
Well Volume:	1.12 gal.		
Total Volume Pumped:	15 gal.		
Number of Well Volumes Pumped	(total volome pumped/well volume):	14 volumes pumped on 10/16/02	0.16 gallans per foot on a 2-Inch Well

Monitoring Well Sample Data : Well RLP-GW3

Date	Temp	pH	Cond	Gallons Parged	Observations
10/16/02	11.6	6.46	1526	5	Slightly turbid
10/16/02	10.9	6.45	1529	7	Slighdy tmbid
10/16/02	10.6	6.44	1484	8	Slightly lurbid
10/16/02	10.8	6.42	1512	9	Clear, Slightly turbid

* Sample collection continued after well development includes well development purge volumes

10/16/02 @ 1100 — Sample Collected

Lithology

0-3.5 feet	Spent pyretic ore with mixed coble and rock.
3.5-16.5 feet	Native rocky cobble material

Presented By	Date	Checked By	Date

CDPHE

WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Project Number: Rico Light Industrial Park	Project Name: Rico Light Industrial Park
Well Number: RLP-GW4	Well Location: Rico Light Industrial Park

Time / Date:	10/16/02	Elevation :	8,800 msl
Drilling Method:	4-Inch Hollow Stem Auger	Weather:	Char Skies, Partly Sunny 60°F
Development Company:	Kaventa Consultine		Sheht Breeze
Date Development Started:	10/16/02	Date Development Completed:	10/16/02
Screen Intervals: 4ft. To 14 ft bgs		Well Diameter:	2 Inch
Depth of Well (L*):	14 ft.	Depth to Water Before Development (L'):	7 ft.
Height of Water Column (L* - L'):	7 fl		
Depth to Top of Sediment (L')	14ft.	Sediment Thickness (L* - L'):	Na ft.
Well Volume:	1.12 gal.		
Total Volume Pumped:	27 gal.		
Number of Well Volumes Pumped	(total volume pumped/well volume):	25+ volumes pumped on 10/16/02	0.16 gallons per foot on a 2-Inch Well

Monitoring Well Sample Data : Well RLP-GW4

Date	Temp	pH	Cond	Gallons Purged	Observations
10/16/02	14.0	7.20	1385	24	Slightly turbid
10/16/02	13.5	7.20	1380	25	Slightly turbid
	13.7	7.20	1383	27	Slightly turbid

* Sample collection continued after well development includes well development purge volumes

10/16/02 @ 1600 — Sarople Collected

Lithology

0-2 feet bgs	Gravel fill material
2-14 feet bgs	Rip rap materials and cobble

Presented By	Date	Checked By	Date

CDPHE

WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Project Number: Rico Light Industrial Park	Project Name: Rico Light Industrial Park
Well Number: RLP-GW5	Well Location: Rico Light Industrial Park

Time / Date:	10/17/02	Elevation :	8,800 msl
Drilling Method:	4-Inch Hollow Stem Auger	Weather:	Clear Skies, Partly Sunny 60°F
Development Company:	Kayenta Consulting		Slight Breeze
Date Development Started:	10/17/02	Date Development Completed:	10/17/02
Screen Intervals: 18 ft. to 23 ft bgs		Well Diameter:	2 Inch
Depth of Well (L"):	23 ft.	Depth to Water Before Development (L'):	15 ft.
Height of Water Column (L" - L'):	8 ft.		
Depth to Top of Sediment (L')	14ft.	Sediment Thickness (L" - L'):	Na ft.
Well Volume:	1.28 gal.		
Total Volume Pumped:	46 gal.		
Number of Well Volumes Pumped	(total volume pumped/well volume):	46 gallons purged on 10/17/02	0.16 gallons per foot on a 2-Inch Well

Monitoring Well Sample Data : Well RLP-GW5

Date	Temp	pH	Cond	Gallons Purged	Obaervations
10/17/02	13.8	6.89	2620	45	Slightly turbid
10/17/02	13.4	6.90	2620	45.5	Clear, Slightly turbid
	13.7	6.91	2610	46	Clear

* Sample collection continued after well development includes well development purge volumes

10/17/02 @ 1145 — Sample Collected

Lithology

0-2 feet bgs	Waste rock materials
2-23 feet bgs	Purple roasted tailings, wet

Presented By	Date	Checked By	Date

CDPHE

WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Project Number: Rico Light Industrial Park	Project Name: Rico Light Industrial Park
Well Number: RLP-GW6	Well Location: Rico Light Industrial Park

Time / Date:	10/17/02	Elevation :	8,800 msl
Drilling Method:	4-Inch Hollow Stem Auger	Weather:	Clear Skies, Partly Sunny 60°F
Development Company:	Kaycnta Consultinn		Shght Breeze
Date Development Started:	10/17/02	Date Development Completed:	10/17/02
Screen Intervals: 12 ft. to 17 ft bgs		Well Diametci:	2 hich
Depth of Well (L^w):	30 ft.	Depth to Water Before Development (L^i):	25 ft.
Height of Water Column (L^w - L^i):	5 ft.		
Depth to Top of Sediment (L^i)	30ft.	Sediment Thickness (L^w - L^i):	Na ft.
Well Volume:	0.8 gal.		
Total Volume Pumped:	8 gal.		
Number of Well Volumes Pumped	(total volume pumped/well volume):	8+ vohimespurged on 10/17/02	0.16 gallons per foot on a 2-Inch Well

Monitoring Well Sample Data : Well RLP-GW6

Date	Temp	pH	Cond	Gallons Purged	Observattons
10/17/02	13.1	6.49	4000	6	Slightly tmbid
10/17/02	12.6	6.38	3970	7	Clear, Slightly turiid
10/17/02	13.1	6.42	4110	8	Clear
			* Purged dry total of 8 times, Collected sample on 9* recharge		

* Sample collection continued after well development includes well development purge volumes

10/17/02 @ 1645 — Sample Collected

Lithology

0-18 feet bgs	Purple roasted tailings mixed with waste rock and river cobble
18-30 feet bgs	Native Rock, Cobble

Presented By	Date	Checked By	Date

CDPHE

WELL DEVELOPMENT

FORM SUMMARY

Project Number: Rico Light Industrial Park	Project Name: Rico Light Industrial Park
Well Number: RLP-GW7	Well Location: Rico Light Industrial Park

Time / Date:	10/17/02	Elevation :	8,800 msl
Drilling Method:	4-Inch Hollow Stem Auger	Weather:	Clear Skies, Partly Sunny 60°F
Development Company:	Kaveota Consulting		Slight Breeze
Date Development Started:	10/17/02	Date Development Completed:	10/17/02
Screen Intervals: 19 ft. to 24 ft bgs		Well Diameter:	2 Inch

Depth of Well (L^w):	24 ft.	Depth to Water Before Development (L^l):	19 ft.
Height of Water Column (L^w - L^l):	5 ft.		
Depth to Top of Sediment (L^l)	24 ft.	Sediment Thickness (L^w - L^l):	Na ft.
Well Volume:	0.8 gal		
Total Volume Pumped:	35 gal.		
Number of Well Volumes Pumped	(total volume pumped/well volume):	43+ volumes purged on 10/17/02	0.16 gallons per foot on a 2-Inch Well

Monitoring Well Sample Data : Well RLP-GW7

Date	Temp	pH	Cond	Gallons Purged	Observatians
10/17/02	15.5	6.51	1679	26	Slightly turbid
10/17/02	15.7	6.51	1719	35	Clear

* Sample collection continued after well development includes well development purge volumes

10/17/02 @ 1550 — Sample Collected

Lithology

0-24 feet bgs — Waste rock / river cobble

Presented By	Date	Checked By	Date

CDPHE

WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Project Number: Rico Light Industrial Park	Project Name: Rico Light Industrial Park
Well Number: RLP-GW8	Well Location: Rico Light Industrial Park

Time / Date:	10/17/02	Elevation :	8,800 msl
Drilling Method:	4-Inch Hollow Stem Auger	Weather:	Clear Skies, Partly Sunny 60°F
Development Company:	Kaventa Consulting		Slight Breeze
Date Development Started:	10/17/02	Date Development Completed:	10/17/02
Screen Intervals: 25 ft. to 30 ft bgs		Well Diameter:	2 Inch
Depth of Well (L"):	30 ft.	Depth to Water Before Development (L'):	25 ft.
Height of Water Column (L" - L'):	5 ft.		
Depth to Top of Sediment (L')	30 ft.	Sediment Thickness (L" - L'):	Na ft.
Well Volume:	0.8 gal.		
Total Volume Pumped:	24 gal.		
Number of Well Volumes Pumped	(total volume pumped/well volume):	24+ volumes purged on 10/17/02	0.16 gallons per foot on a 2-Inch Well

Monitoring Well Sample Data : Well RLP-GW8

Date	Temp	pH	Cond	Gallons Purged	Observations
10/17/02	13.0	6.46	2510	22	Clear, Slightly turbid
10/17/02	12.9	6.58	2520	23	Clear, Sbghtly turbid
10/17/02	12.5	6.64	2520	24	Clear, Shghtly turbid

* Sample collection continued after well development includes well development purge volumes

10/17/02 @ 1735 — Sample Collected

Lithology

0-1 feet bgs	Fill material
1-24 feet bgs	Red purple slimes, roasted tailings, saturated
24 – 30 feet bgs	Native materials, river cobble

Presented By	Date	Checked By	Date

BORING B-1

SURFACE ELEVATION 8833

COORDINATES

OTHER TESTS	STRENGTH TEST RESULTS: TYPE OF TEST	STRENGTH TEST RESULTS: CONFINING PRESSURE (psf)	STRENGTH TEST RESULTS: PEAK SHEAR STRENGTH (psf)	% PASSING NO. 200 SIEVE	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LL (%)	ATTERBERG LIMITS: PI (%)	ATTERBERG LIMITS: FI (%)	SAMPLING: BLOW COUNT	SAMPLING: SAMPLE TYPE	DEPTH IN FEET	SAMPLING SYMBOLS	DESCRIPTION
												0		BROWN FINE TO COARSE SANDY GRAVEL WITH SILT MEDIUM DENSE
										15	SPT	5		GRAVELS WITH LENSES OF SILTY SAND AND SANDY SILT
										9	SPT	10	SM	CLAYEY SAND AND GRAVELS WITH SOME CLAY GRAVELS LOOSE TO MEDIUM DENSE
										7	SPT	15		CLAYEY LOOSE
				14						19	SPT	20		GRAVELS WITH MORE FINES AND MEDIUM DENSE
										28	D	25	SM	DARK BROWN TO BLACK SILTY GRAVEL WITH SAND, MEDIUM DENSE
										21	SPT	50	SM	BROWN SILTY FINE TO COARSE SAND WITH SOME GRAVEL MEDIUM DENSE
										50/5"	SPT	35	SM	BROWN SANDY GRAVEL, DENSE TO VERY DENSE
												40		AUGER REFUSAL AT 33 FEET
												45		DRILLING COMPLETED AT 48.5 FEET
												50		ON 6/3/81
												55		WATER ENCOUNTERED AT 21.5 FEET ON 6/3/81
												60		
												65		
												70		

FILL

KEY

- ■ INDICATES UNDISTURBED SAMPLE
- ▣ INDICATES DISTURBED SAMPLE
- □ INDICATES SAMPLING ATTEMPT WITH NO RECOVERY
- ▣ INDICATES STANDARD PENETRATION TEST SAMPLE
- P - IN BLOW COUNT COLUMN INDICATES SAMPLER HYDRAULICALLY PUSHED

SAMPLE TYPE

- U - DAMES & MOORE "U" SIT
- T - DAMES & MOORE THIN-WALL
- P - DAMES & MOORE PISTON
- SPT - STANDARD SPLIT-SPOON
- D - DAMES & MOORE "D" SAMPLER

NOTE:

1. THE SOIL CONDITIONS ARE DESCRIBED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM, PLATE A-3.
2. BLOW COUNT HAS BEEN TAKEN AS THE NUMBER OF BLOWS REQUIRED TO DRIVE A SAMPLER TO ONE-FOOT INCREMENTS USING A 140 POUND WEIGHT FALLING 30 INCHES.

LOG OF BORING

DAMES & MOORE

FILE ANACONDA RIO 04010-002-1108

BORING B-2

SURFACE ELEVATION 8834

COORDINATES

OTHER TESTS	STRENGTH TEST RESULTS			% PASSING NO. 200 SIEVE	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			SAMPLING		DEPTH IN FEET	SAMPLING	SYMBOLS	DESCRIPTION
	TYPE OF TEST	CONFINING PRESSURE (psf)	PEAK SHEAR STRENGTH (psf)				LL (%)	PI (%)	PI (%)	BLOW COUNT	SAMPLE TYPE				
										26	SPT	0		SC	BROWN CLAYEY SAND WITH GRAVEL MEDIUM DENSE
												5		SM	BROWN AND GREY GRAVELLY SAND WITH SOME CLAY
GRADATION				22			32	17	15	8	SPT	10		SC	YELLOW AND BROWN FINE TO COARSE CLAYEY SAND WITH GRAVEL LOOSE
										12	SPT	15			LUMBER FRAGMENTS AT 15 FEET GRADES MEDIUM DENSE
										21	SPT	20		GW-GM	GREY & BROWN SANDY GRAVEL WITH SOME SILT MEDIUM DENSE
						67	67	51	16	5	SPT	25		ML	DARK BROWN AND BLACK FINE SANDY SILT SOFT TO MEDIUM STIFF
						66				11	SPT				
										50 for 7/4"	SPT	30			AUGER REFUSAL AT 30.5 FEET BORING COMPLETED AT 30.5 FEET ON 5/4/81 WATER ENCOUNTERED AT 20.7 FEET ON 5/3/81
												36			
												40			
												45			
												50			
												55			
												60			
												65			
												70			

FILL

KAY

- ■ INDICATES UNDISTURBED SAMPLE
- ⊠ INDICATES DISTURBED SAMPLE
- □ INDICATES SAMPLING ATTEMPT WITH NO RECOVERY
- ☑ INDICATES STANDARD PENETRATION TEST SAMPLE
- P - IN BLOW COUNT COLUMN INDICATES SAMPLER HYDRAULICALLY PUSHED

SAMPLE TYPE

- U - DAMES & MOORE "U" BIT
- T - DAMES & MOORE THIN-WALL
- P - DAMES & MOORE PISTON
- SPT - STANDARD SPLIT-SPOON
- D - DAMES & MOORE "D" SAMPLER

NOTE:

SEE PLATE A - 1A.

LOG OF BORING

DAMES & MOORE

PLATE A-1B

FILE ANACONDA RIO 04010-082-1408

BORING B-3

SURFACE ELEVATION 5836

COORDINATES

OTHER TESTS	STRENGTH TEST RESULTS: TYPE OF TEST	STRENGTH TEST RESULTS: CONFINING PRESSURE (psf)	STRENGTH TEST RESULTS: PEAK SHEAR STRENGTH (psf)	% PASSING NO. 200 SIEVE	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LL (%)	ATTERBERG LIMITS: PL (%)	ATTERBERG LIMITS: PI (%)	SAMPLING: BLOW COUNT	SAMPLING: SAMPLE TYPE	DEPTH IN FEET	SAMPLING	SYMBOLS	DESCRIPTION
												0			BROWN SANDY CLAYEY GRAVEL WITH SAND LOOSE
										8	SPT	5			SAMPLER DRIVEN THROUGH COBBLE
										32	SPT	10			GRADES MEDIUM DENSE
										7	SPT	15			
										23	SPT	20			AUGER REFUSAL AT 20' BORING COMPLETED AT 20 FEET ON 6/5/81 NO WATER ENCOUNTERED
												25			
												50			

FILL

BORING B-4

SURFACE ELEVATION 8835

COORDINATES

OTHER TESTS	STRENGTH TEST RESULTS: TYPE OF TEST	STRENGTH TEST RESULTS: CONFINING PRESSURE (psf)	STRENGTH TEST RESULTS: PEAK SHEAR STRENGTH (psf)	% PASSING NO. 200 SIEVE	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LL (%)	ATTERBERG LIMITS: PL (%)	ATTERBERG LIMITS: PI (%)	SAMPLING: BLOW COUNT	SAMPLING: SAMPLE TYPE	DEPTH IN FEET	SAMPLING	SYMBOLS	DESCRIPTION
												0			BROWN CLAYEY SAND AND GRAVEL WITH COBBLES LOOSE
										8	SPT	5			
GRADATION				22		15	27	21	6	5	SPT	10		SC-GC	
												15			
										1	SPT	20			DARK BROWN SILTY AND SANDY CLAY WITH ORGANIC MATERIAL
												25			AUGER REFUSAL AT 24.5 FEET BORING COMPLETED AT 24.5 FEET ON 6/5/81 NO WATER ENCOUNTERED
												30			

FILL

KEY

- ■ INDICATES UNDISTURBED SAMPLE
- ⊠ INDICATES DISTURBED SAMPLE
- □ INDICATES SAMPLING ATTEMPT WITH NO RECOVERY
- ◪ INDICATES STANDARD PENETRATION TEST SAMPLE
- P - IN BLOW COUNT COLUMN INDICATES SAMPLER HYDRAULICALLY PUSHED

SAMPLE TYPE

- U - DAMES & MOORE "U" BIT
- T - DAMES & MOORE THIN-WALL
- P - DAMES & MOORE PISTON
- SPT - STANDARD SPLIT-SPOON
- D - ANMCS & MOORE "D" SAMPLER

NOTE:

SEE PLATE A - 1A.

LOG OF BORING

DAMES & MOORE

FILE ANACONDA RICO 04010-092-1605

BORING B-5

SURFACE ELEVATION 8839

COORDINATES

OTHER TESTS	STRENGTH TEST RESULTS: TYPE OF TEST	CONFINING PRESSURE (psf)	PEAK SHEAR STRENGTH (psf)	% PASSING NO. 200 SIEVE	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LL (%)	PL (%)	PI (%)	SAMPLING: BLOW COUNT	SAMPLE TYPE
ON SULFATES						5	31	20	11	11	SPT
										11	SPT
										32	SPT
				43						11	SPT
						13	44	23	21	38	SPT
										50 for 4 1/2"	SPT

DEPTH IN FEET: 0, 5, 10, 15, 20, 25, 30, 35

SAMPLING

SYMBOLS

DESCRIPTION

BROWN SANDY CLAY WITH SOME GRAVEL STIFF — CL

GRAVES WITH MORE GRAVEL — GM

YELLOW-BROWN GRAVELLY SAND WITH SOME CLAY AND WOOD FRAGMENTS LOOSE TO MEDIUM DENSE — SM

FILL

ARRY BROWN SANDY CLAY — CL

AUGER REFUSAL AT 29.5 FEET
BEATBERED SANDSTONE BEDROCK
BORING COMPLETED AT 30.25 FEET ON 5/E/81
WATER ENCOUNTERED AT 25.5 FEET M 5/6/81

BORING B-6

SURFACE ELEVATION 8793

COORDINATES

OTHER TESTS	STRENGTH TEST RESULTS: TYPE OF TEST	CONFINING PRESSURE (psf)	PEAK SHEAR STRENGTH (psf)	% PASSING NO. 200 SIEVE	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LL (%)	PL (%)	PI (%)	SAMPLING: BLOW COUNT	SAMPLE TYPE
										2/4"	SPT
				25			28	18	7	5	SPT
										50/0"	SPT

DEPTH IN FEET: 0, 5, 10, 15, 20, 25

SAMPLING

SYMBOLS

DESCRIPTION

DARK BROWN SILTY SAND WITH GRAVEL AND COBBLES MEDIUM DENSE — SM

DARK BROWN CLAYEY SILT AND SILTY CLAY WITH GRAVEL AND COBBLES MEDIUM STIFF — CL

AUGER REFUSAL AT 10 FEET
BORING COMPLETED AT 11 FEET ON 6/7/81
WATER ENCOUNTERED AT 5 FEET ON 6/7/81

KEY

- ■ INDICATES UNDISTURBED SAMPLE
- ⊠ INDICATES DISTURBED SAMPLE
- □ INDICATES SAMPLING ATTEMPT WITH NO RECOVERY
- ◪ INDICATES STANDARD PENETRATION TEST SAMPLE
- P - IN BLOW COUNT COLUMN INDICATES SAMPLER HYDRAULICALLY PUSHED

SAMPLE TYPE

- U - DAMES & MOORE "U" BIT
- T - DAMES & MOORE TWIN-WALL
- P - DAMES & MOORE PISTON
- SPT - STANDARD SPLIT-SPOON
- D - DAMES & MOORE "D" SAMPLER

NOTE:

SEE PLATE A - 1A.

LOG OF BORING

DAMES & MOORE

FILE ANACONDA RICO 04010-062-1605

BORING B-7

SURFACE ELEVATION 8808

COORDINATES

OTHER TESTS	STRENGTH TEST RESULTS			% PASSING NO 200 SIEVE	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			SAMPLING	
	TYPE OF TEST	CONFINING PRESSURE (psf)	PEAK SHEAR STRENGTH (psf)				LL (%)	PL (%)	PI (%)	BLOW COUNT	SAMPLE TYPE
										7	SPT
										8	SPT
										33	SPT

DEPTH IN FEET: 0, 5, 10, 15, 20, 25, 30

SAMPLING

SYMBOLS DESCRIPTION

BROWN AND GREY SANDY GRAVEL WITH SOME SILT LOOSE

BROWN CLAYEY SAND WITH GRAVEL LOOSE TO MEDIUM DENSE

BROWN SANDY GRAVEL WITH SILT MEDIUM DENSE TO DENSE

AUGER REFUSAL AT 17.5 FEET
BORING COMPLETED AT 17.5 FEET ON 8/7/81
WATER LEVEL ENCOUNTERED AT 15 FEET

BORING B-8

SURFACE ELEVATION 8814

COORDINATES

OTHER TESTS	STRENGTH TEST RESULTS			% PASSING NO. 200 SIEVE	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			SAMPLING	
	TYPE OF TEST	CONFINING PRESSURE (psf)	PEAK SHEAR STRENGTH (psf)				LL (%)	PL (%)	PI (%)	BLOW COUNT	SAMPLE TYPE
										2	SPT
GRADATION				10						25/6"	SPT

DEPTH IN FEET: 0, 5, 10, 15, 20, 25, 30

SAMPLING

SYMBOLS DESCRIPTION

BROWN SILTY FINE TO COARSE SAND WITH SOME GRAVEL LOOSE TO MEDIUM DENSE

DARK BROWN CLAYEY SILT WITH SAND

BROWN SANDY FINE GRAVEL WITH CLAY

AUGER REFUSAL AT 12 FEET
BORING COMPLETED AT 12 FEET ON 8/7/81
WATER LEVEL ENCOUNTERED AT 9 FEET ON 8/7/81

KEY

- ■ INDICATES UNDISTURBED SAMPLE
- ⊠ INDICATES DISTURBED SAMPLE
- ☐ INDICATES SAMPLING ATTEMPT WITH NO RECOVERY
- ☑ INDICATES STANDARD PENETRATION TEST SAMPLE
- P - IN BLOW COUNT COLUMN INDICATES SAMPLER HYDRAULICALLY PUSHED

SAMPLE TYPE

- U - DAMES & MOORE "U" BIT
- T - DAMES & MOORE THIN-WALL
- P - DAMES & MOORE PISTON
- SPT - STANDARD SPLIT-SPOON
- D - DAMES & MOORE "D" SAMPLER

NOTE:
SEE PLATE A - 1A.

Added 2/19/07

LOG OF BORING

DAMES & MOORE

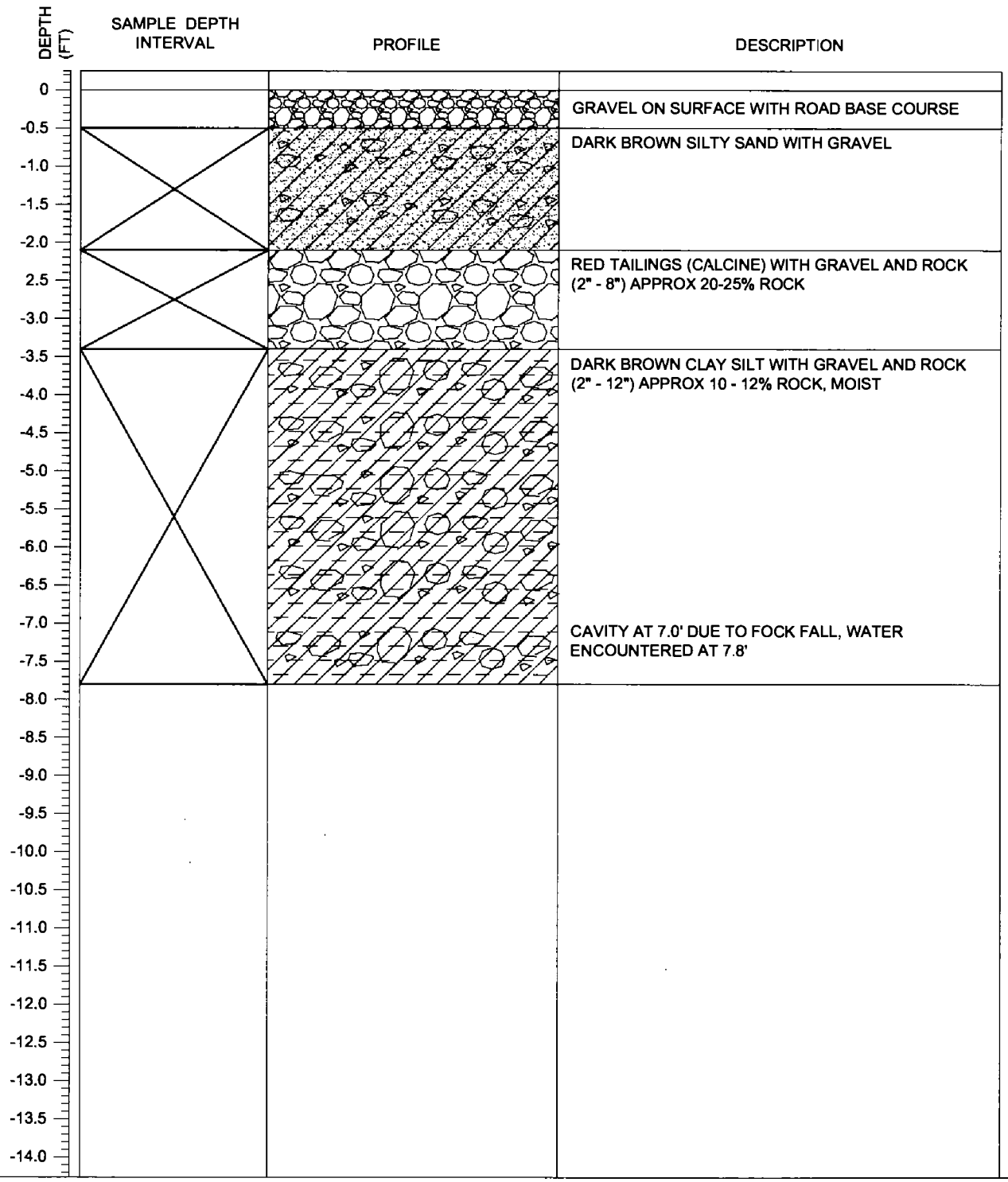
PLATE A-1E

Test Pit Logs

- Anderson Engineering / SEH, 2008
- SEH, 2004
- SEH, 2001
- Anderson Engineering, 1996

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-1	COORDINATES OR LOCATION:	LAT: 37.7075 LON: -108.0321
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 7.8' GWL DEPTH:	(ENCOUNTERED) (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/10/08 DATE COMPLETED: 10/10/08



TD = 7.8'

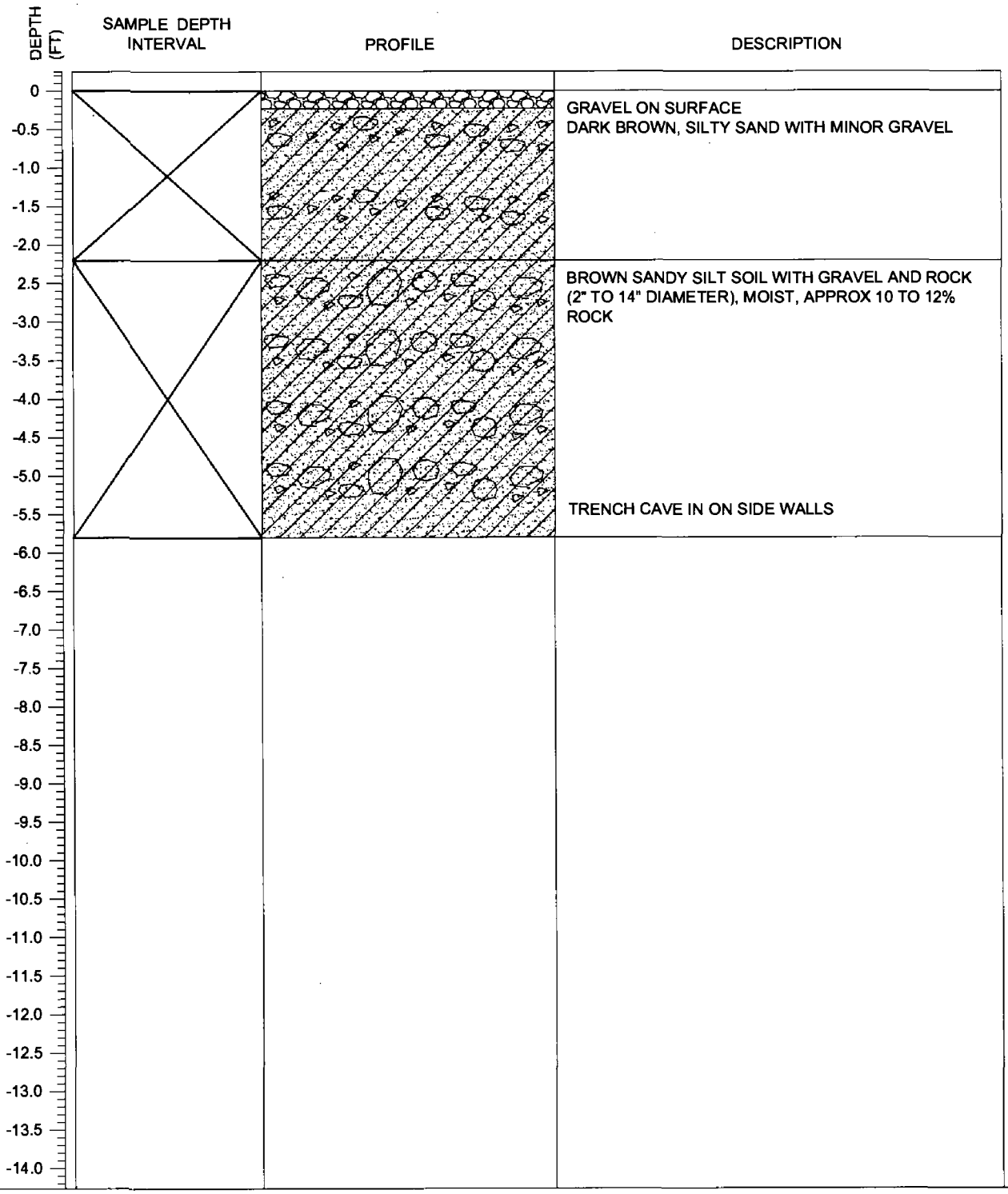
NOTES: PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
ENGINEERING COMPANY, INC.

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-2		COORDINATES OR LOCATION: LAT: 37.7063 LON: -108.0321
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: N/A (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/10/08 DATE COMPLETED: 10/10/08



TD = 6.0'

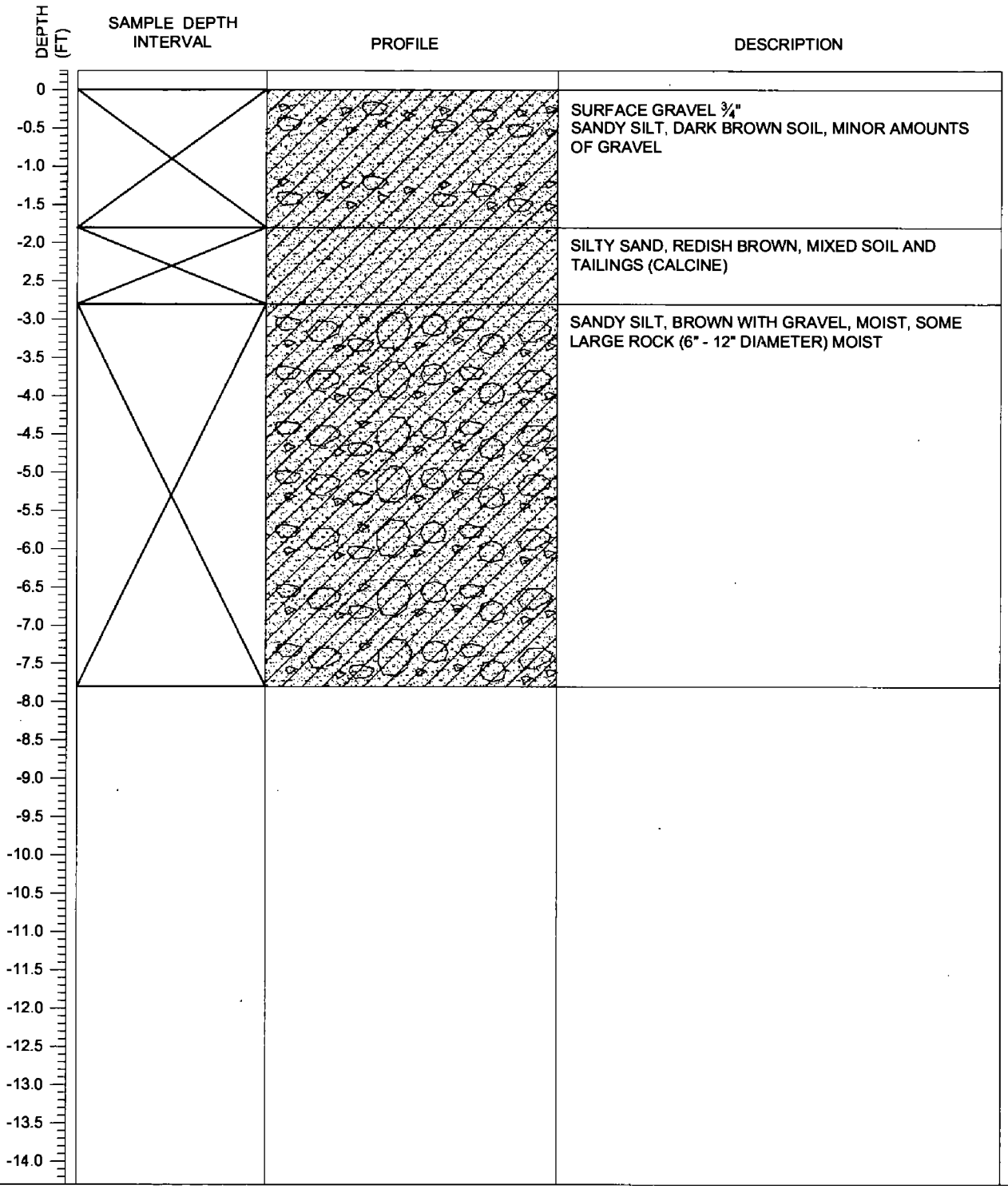
NOTES: DID NOT CONTINUE DUE TO TRENCH CAVE IN ON SIDE WALLS

X = SAMPLE, BACKFILLED AND COMPACTED

ANDERSON
ENGINEERING COMPANY, INC

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-3		COORDINATES OR LOCATION: LAT: 37.7054 LON: -108.0317
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: N/A (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/9/08 DATE COMPLETED: 10/9/08



TD = 7.8'

NOTES: NO WATER, TEST PIT BACKFILLED, COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF INTERVAL

ANDERSON
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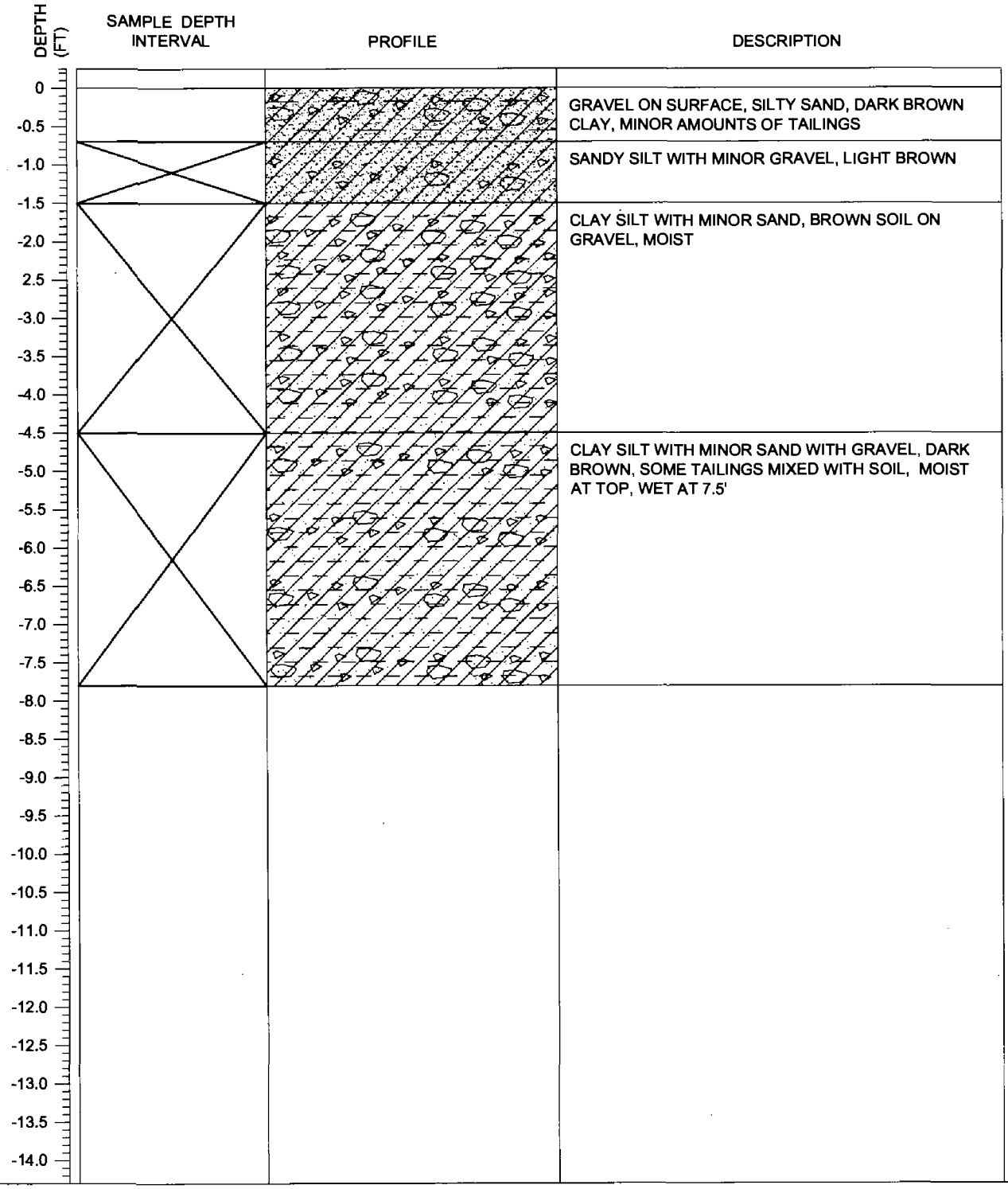
TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-4		COORDINATES OR LOCATION: LAT: 37.7054 LON: -108.0312
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: 7.8' (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/10/08 DATE COMPLETED: 10/10/08



TD = 7.8'

NOTES: WATER; BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

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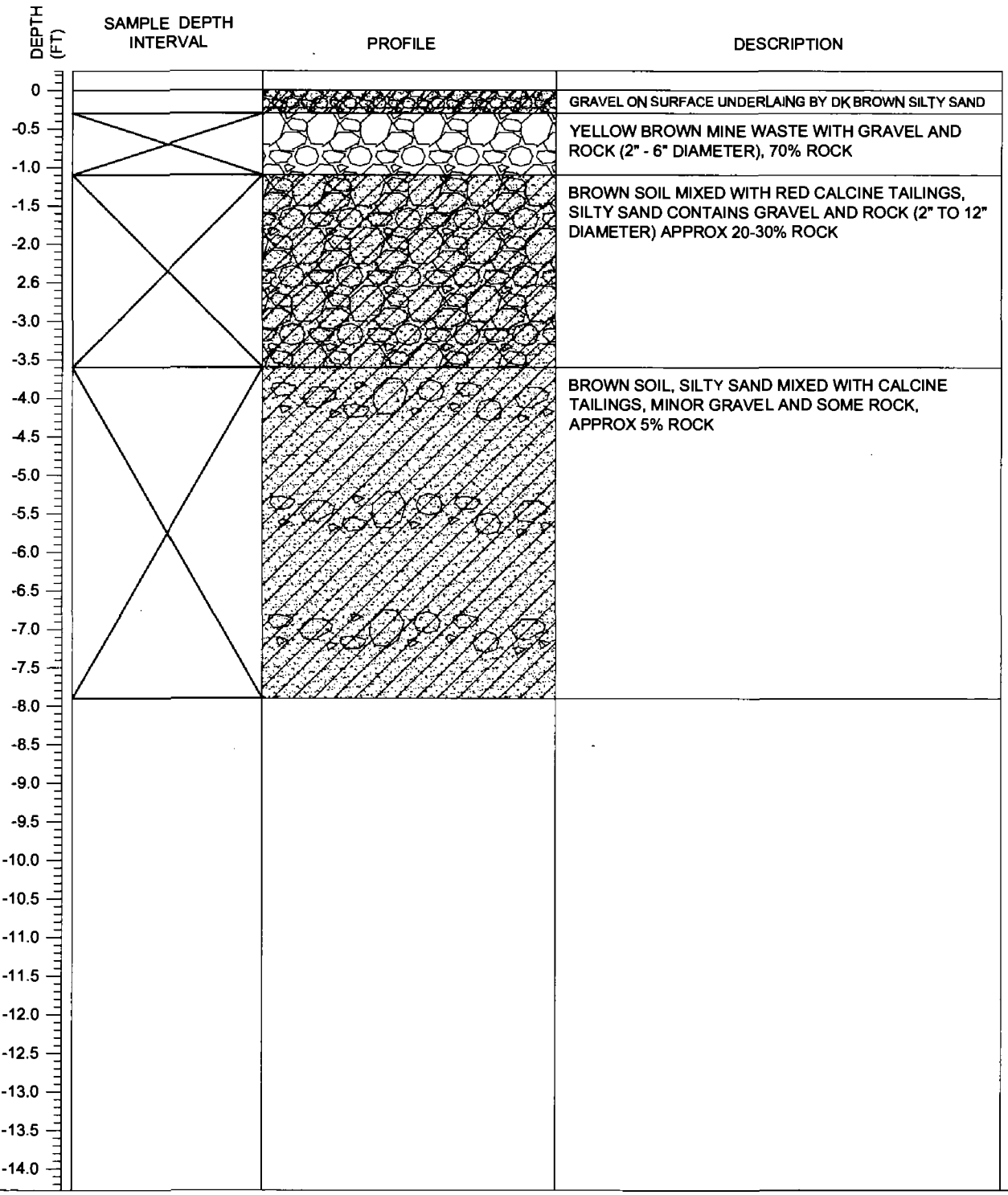
ENGINEERING COMPANY, INC.

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-5	COORDINATES OR LOCATION:	LAT: 37.7054 LON: -108.0305
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: N/A GWL DEPTH:	(ENCOUNTERED) (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/13/08 DATE COMPLETED: 10/13/08



TD = 7.9'

NOTES: TEST PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
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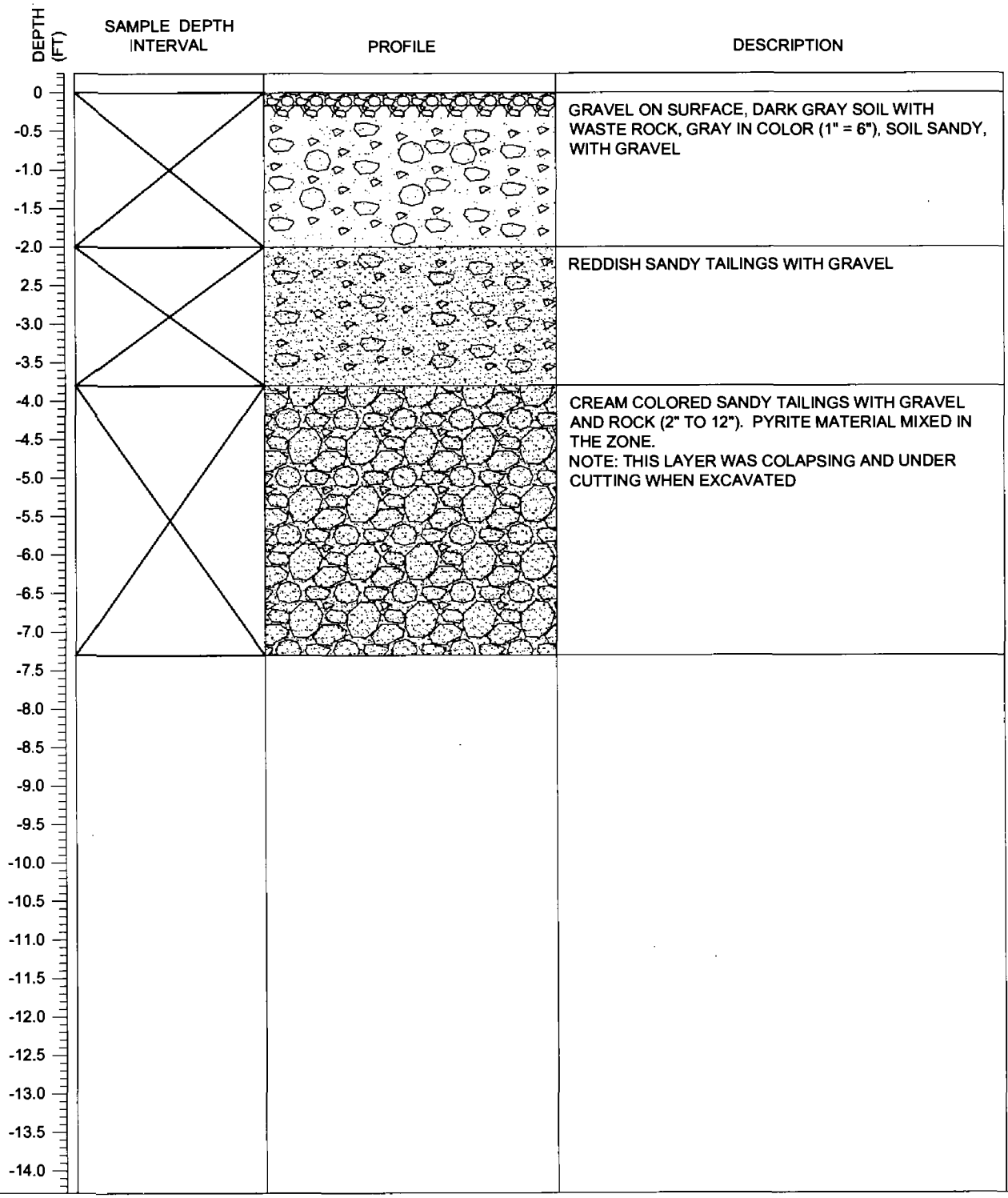
TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-6	COORDINATES OR LOCATION:	LAT: 37.7041 LON: -108.0311
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: N/A GWL DEPTH:	(ENCOUNTERED) (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/9/08 DATE COMPLETED: 10/9/08



TD = 7.3'

NOTES: NO WATER, PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

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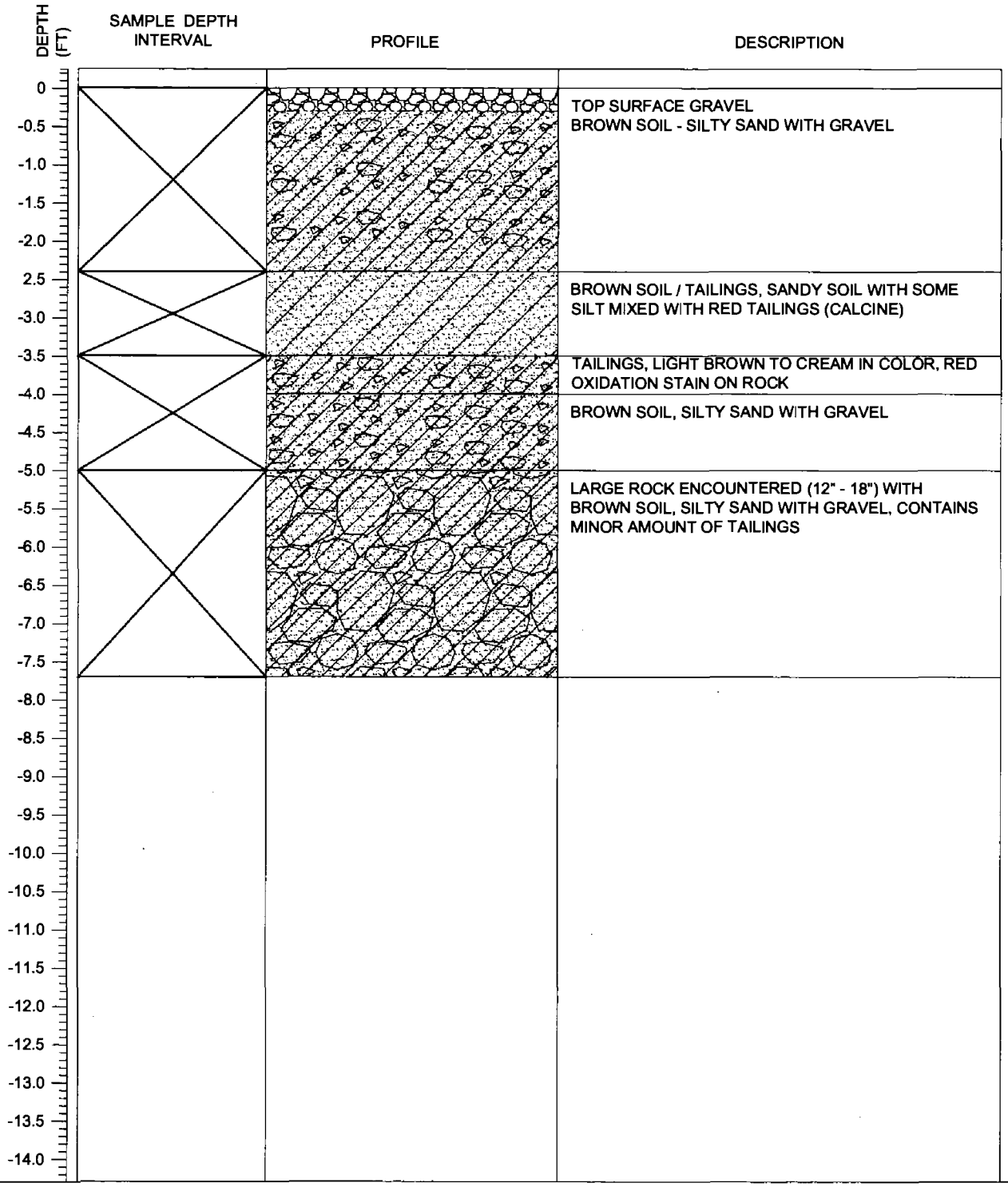
ENGINEERING COMPANY, INC.

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-7	COORDINATES OR LOCATION:	LAT: 37.7040 LON: -108.0304
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: N/A GWL DEPTH:	(ENCOUNTERED) (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/9/08 DATE COMPLETED: 10/9/08



TD = 7.7'

NOTES: NO WATER ENCOUNTERED, PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

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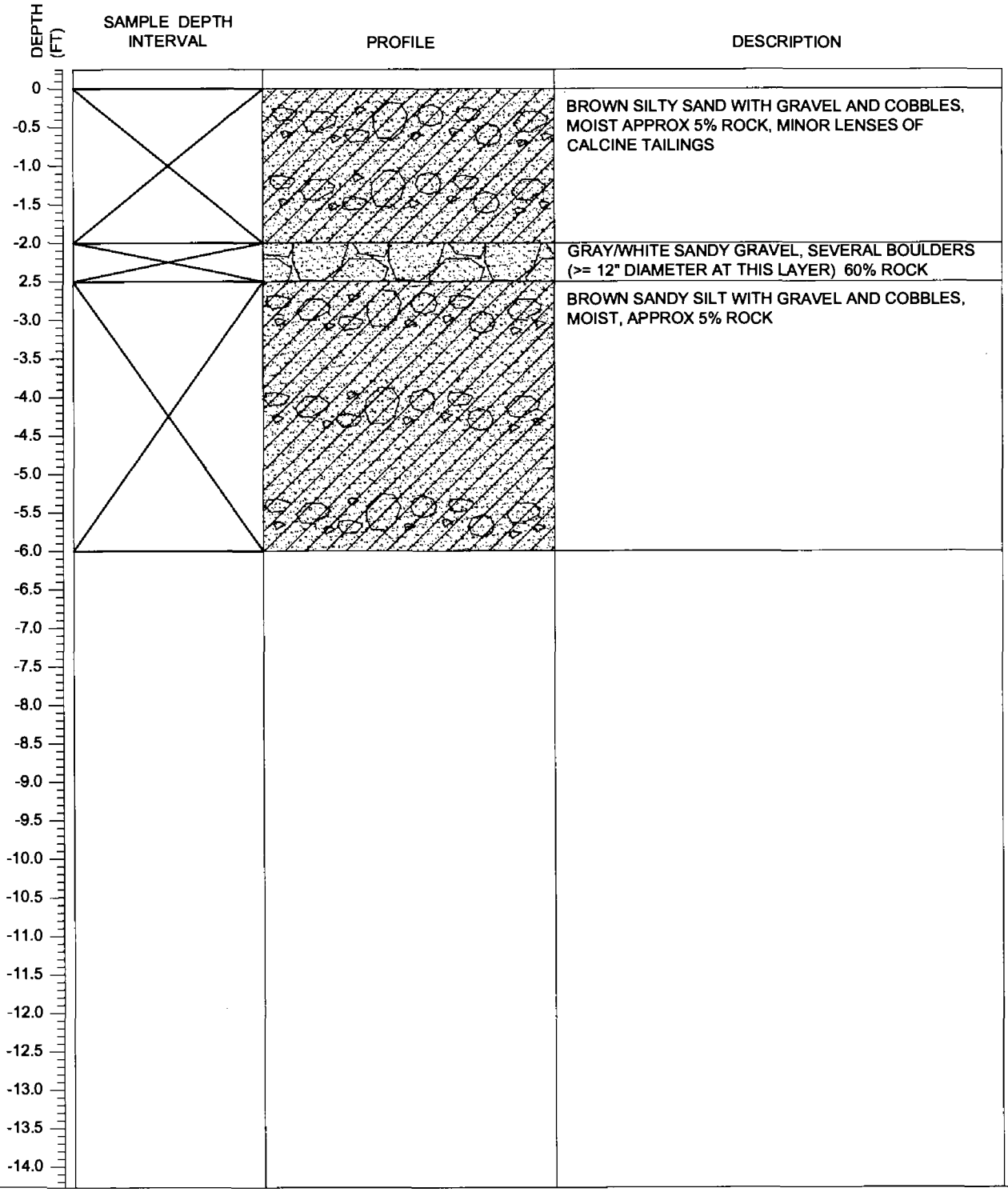
TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-8	COORDINATES OR LOCATION:	LAT: 37.7044 LON: -108.0299
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: N/A GWL DEPTH:	(ENCOUNTERED) (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/14/08 DATE COMPLETED: 10/14/08



TO = 6.0'

NOTES: TEST PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

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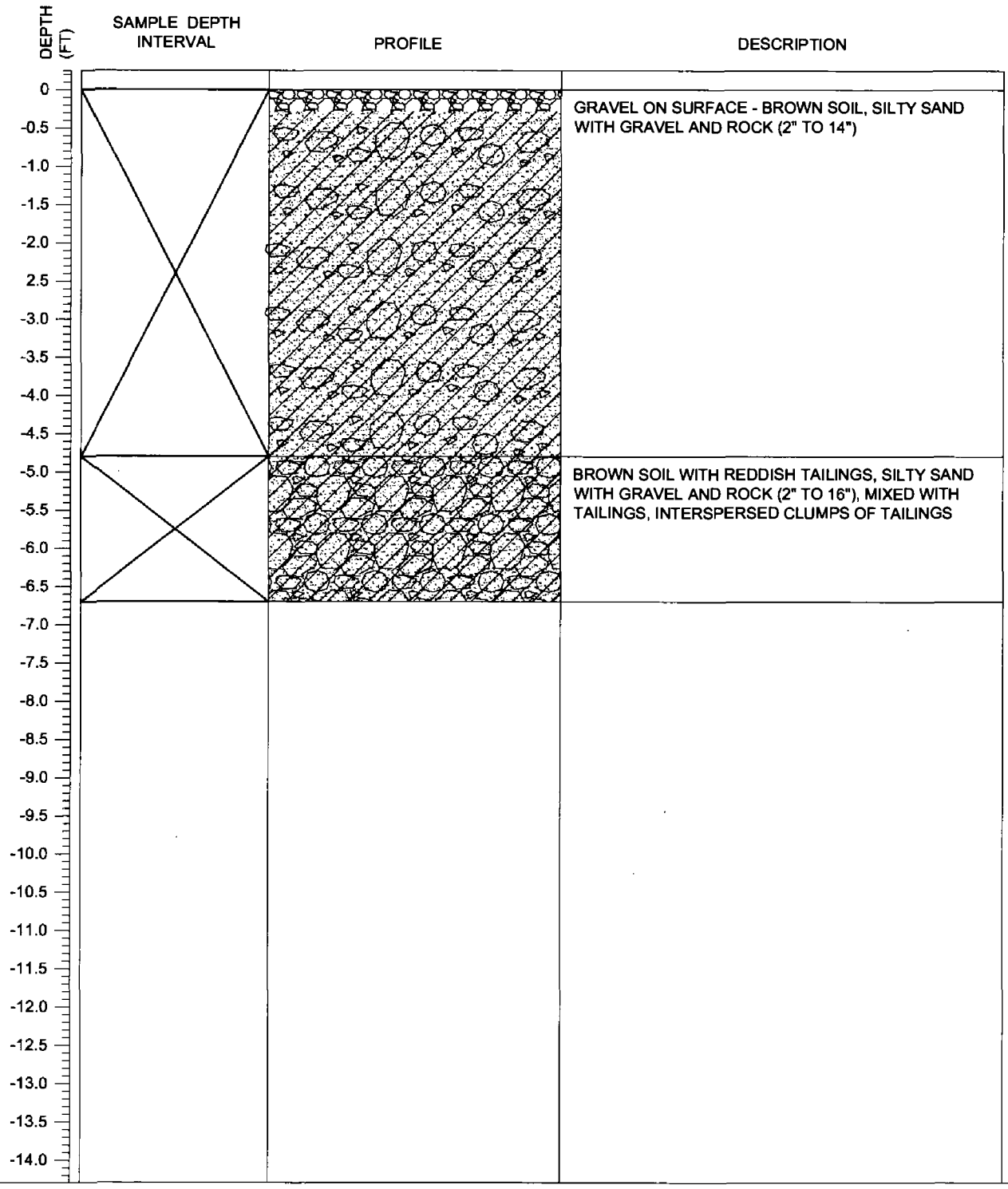
TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-9		COORDINATES OR LOCATION: LAT: 37.7029 LON: -108.0300
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: 6.7' (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/9/08 DATE COMPLETED: 10/9/08



TD = 6.7'

NOTES: TEST PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF INTERVAL

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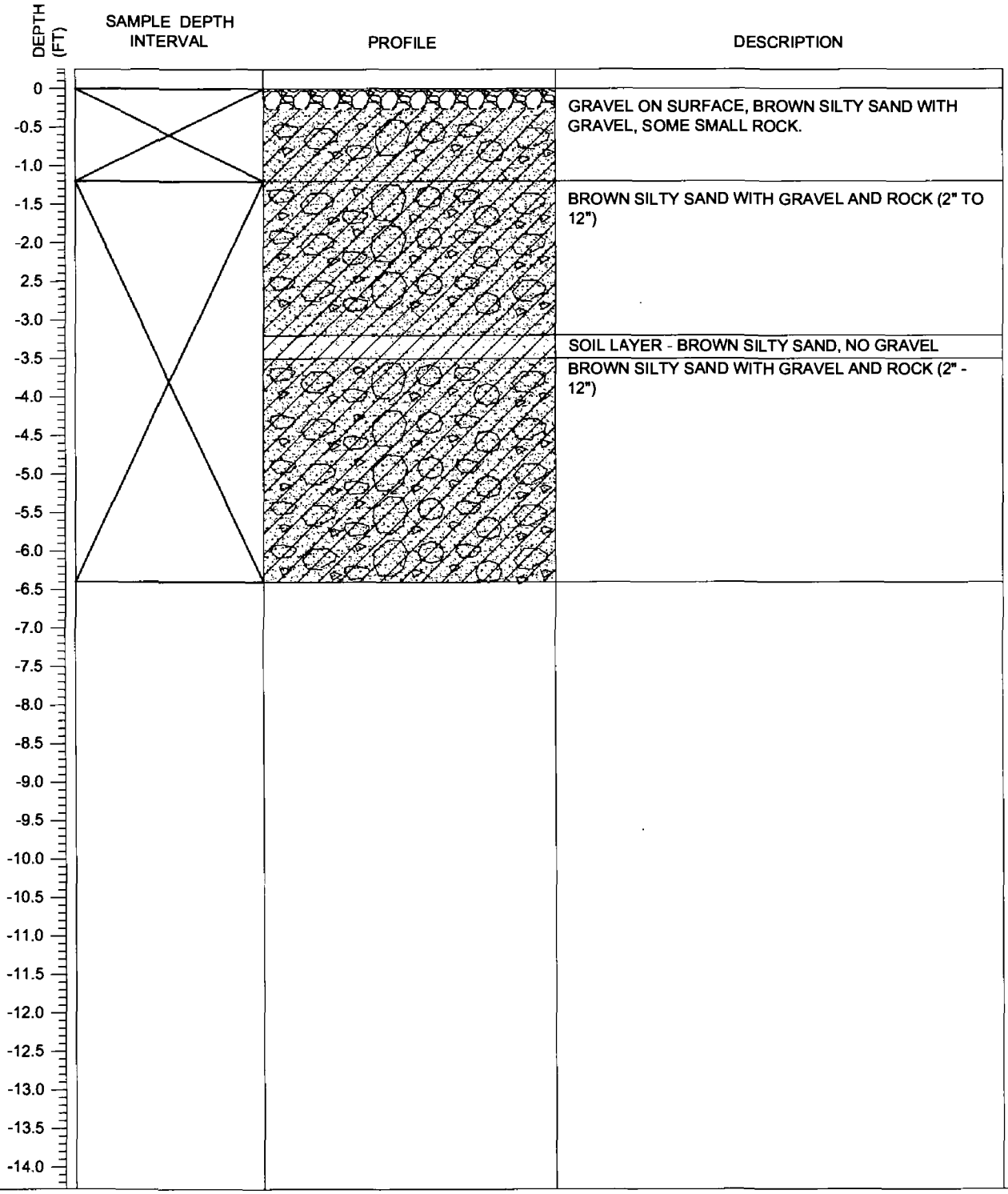
TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-10	COORDINATES OR LOCATION: LAT: 37.7025 LON: -108.0305
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 6.4' (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A
		DATE STARTED: 10/9/08 DATE COMPLETED: 10/9/08



TD = 6.4'

NOTES: PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

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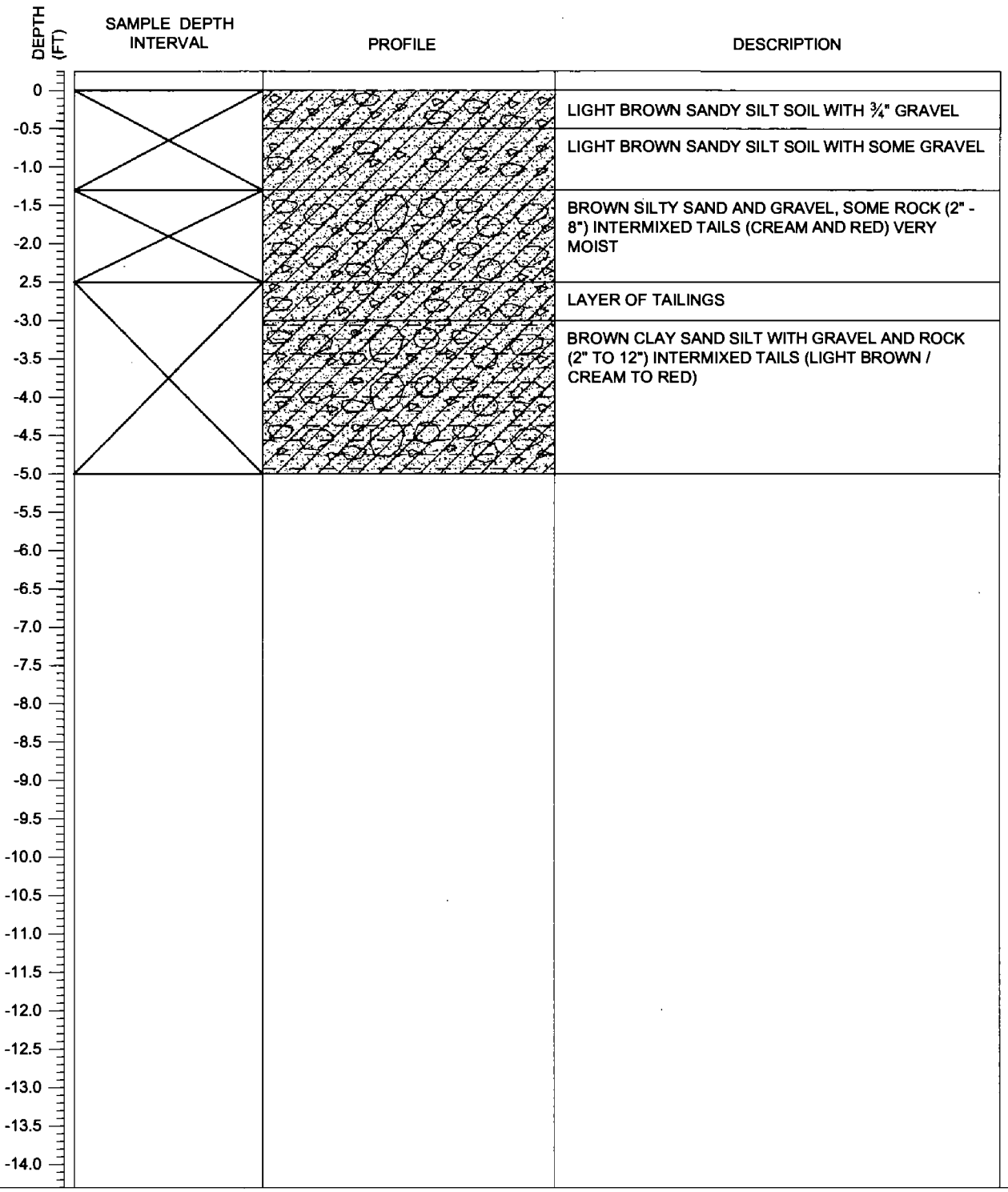
TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-11	COORDINATES OR LOCATION:	LAT: 37.7018 LON: -108.0302
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: 4.2' GWL DEPTH:	(ENCOUNTERED) (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/9/08 DATE COMPLETED: 10/9/08



TD = 5.0'

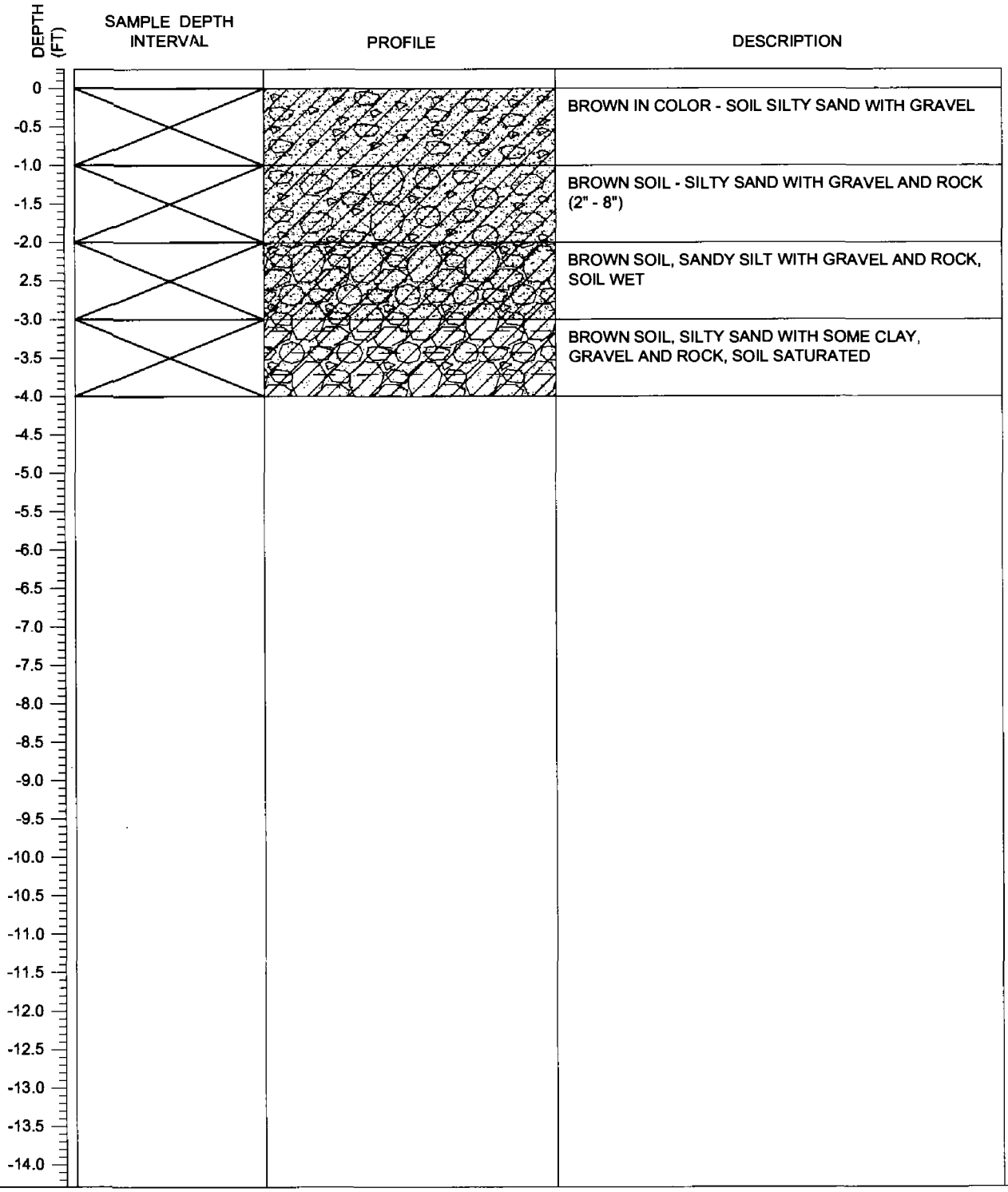
NOTES: PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
ENGINEERING COMPANY, INC

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-12		COORDINATES OR LOCATION: LAT: 37.7013 LON: -108.0304
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: 3.4' (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/9/08 DATE COMPLETED: 10/9/08



TD = 4.0'

NOTES: PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

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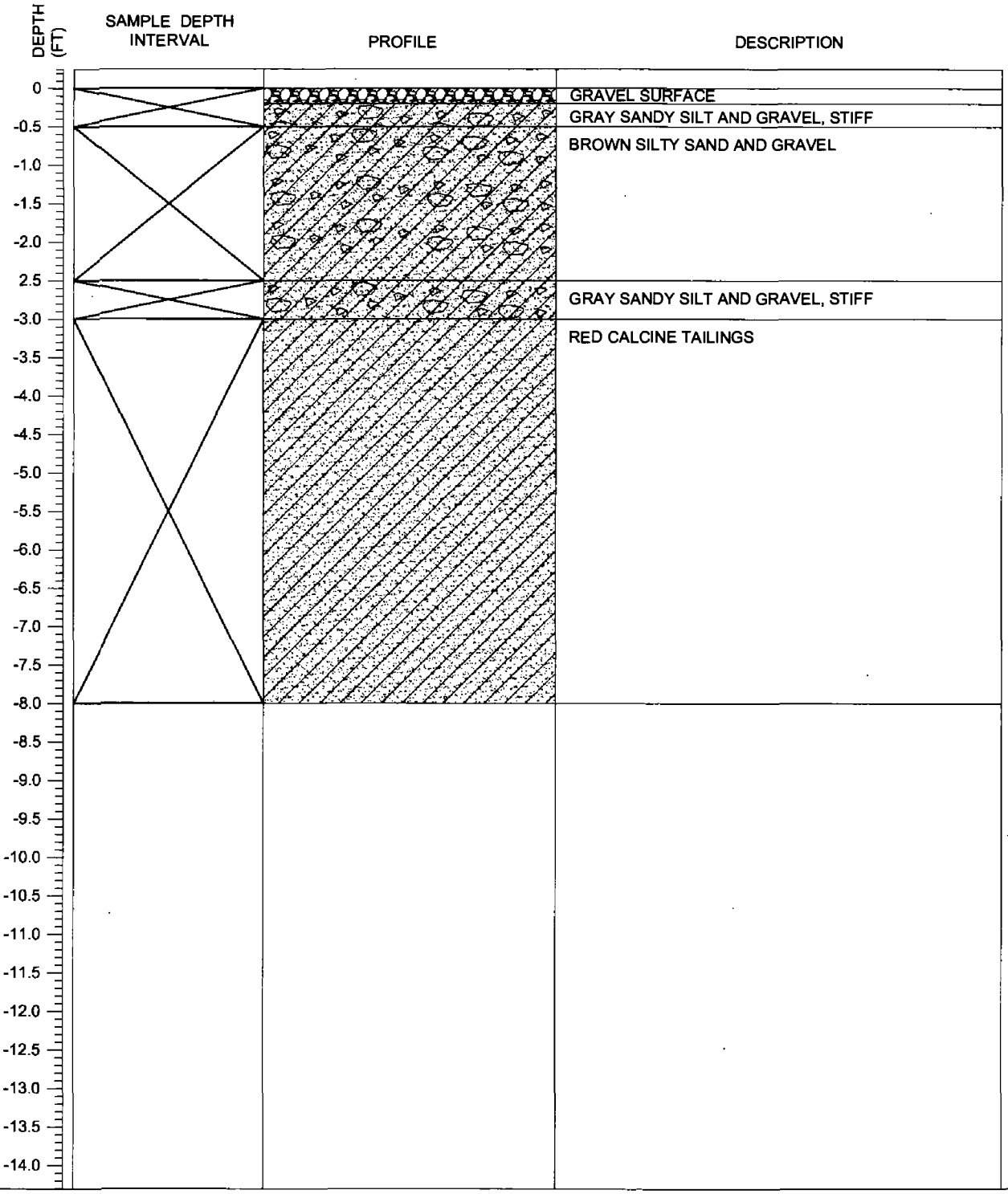
TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-13		COORDINATES OR LOCATION: LAT: 37.7065 LON: -108.0306
LOGGED BY: KC CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: 0' NG WATER (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/14/08 DATE COMPLETED: 10/14/08



TD = 8.0'

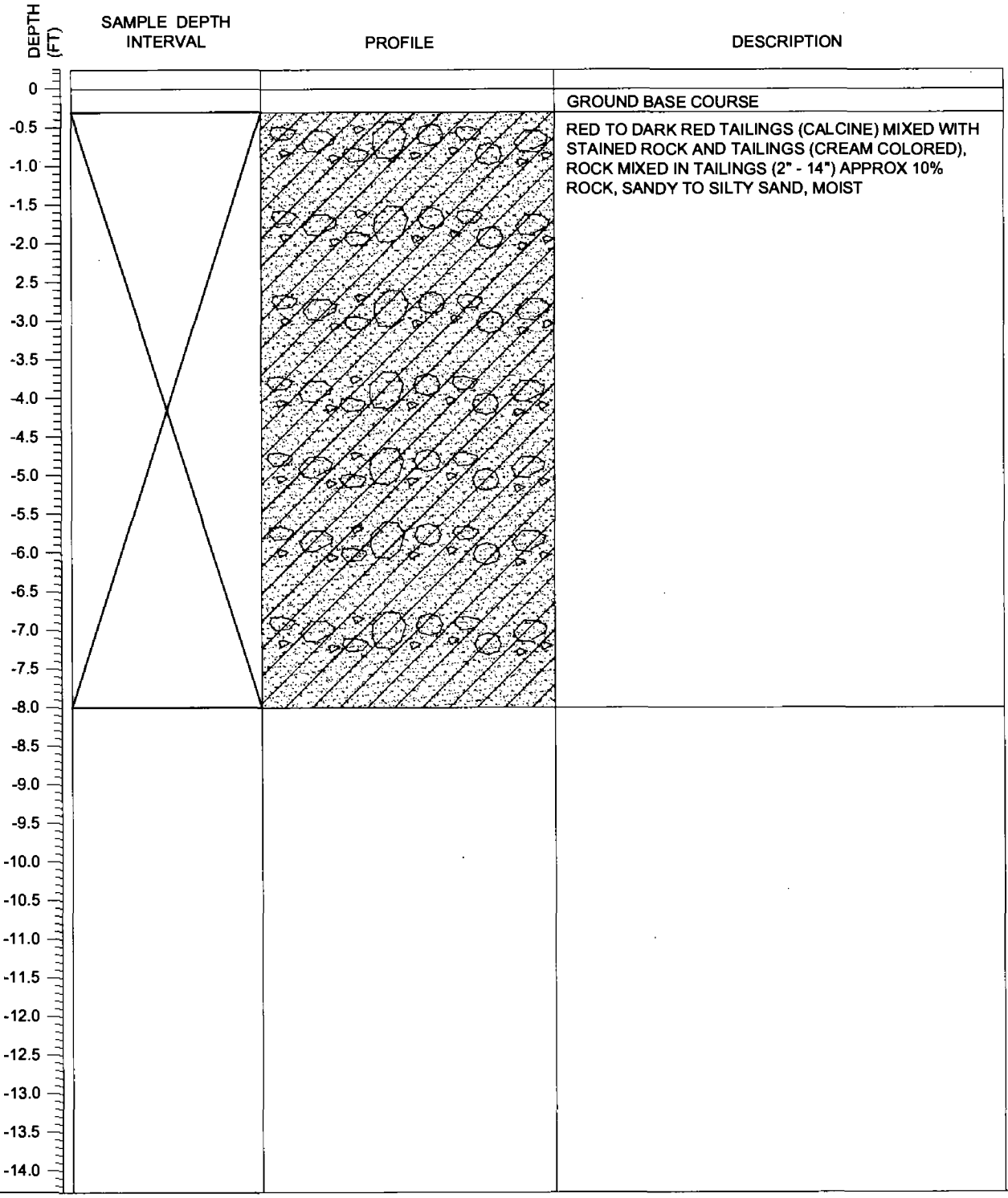
NOTES: TEST PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
ENGINEERING COMPANY, INC

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-14		COORDINATES OR LOCATION: LAT: 37.7069 LON: -108.0312
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: N/A (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/10/08 DATE COMPLETED: 10/10/08



TD = 8.0'

NOTES: NO WATER, BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
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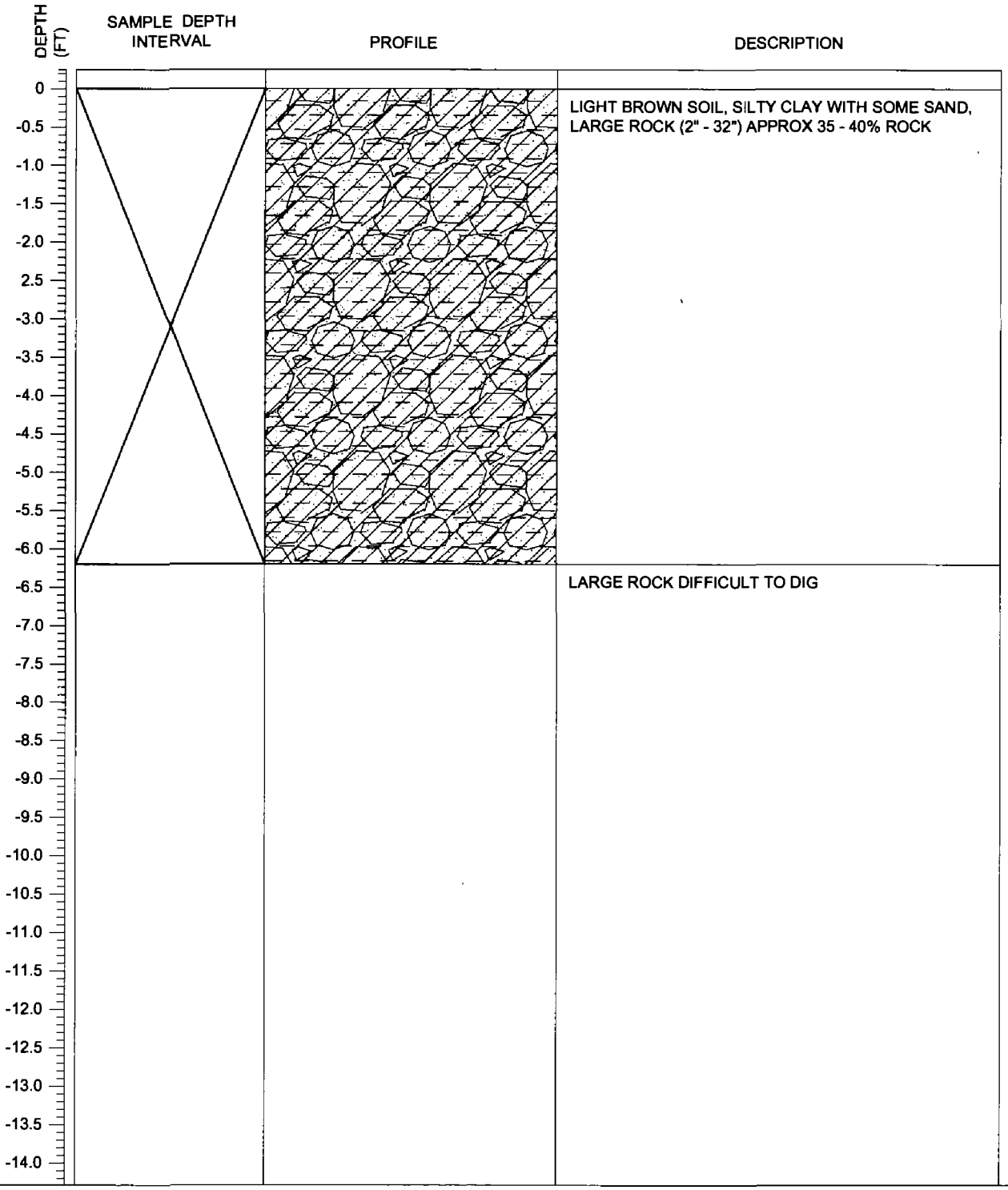
TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-15	COORDINATES OR LOCATION:	LAT: 37.7054 LON: -108.0292
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: N/A GWL DEPTH:	(ENCOUNTERED) (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/13/08 DATE COMPLETED: 10/13/08



TD = 6.2'
AND COMPACTED
X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

NOTES: TP 15 AND 16 SIMILAR SOIL PROFILES; TEST PIT BACKFILLED

ANDERSON
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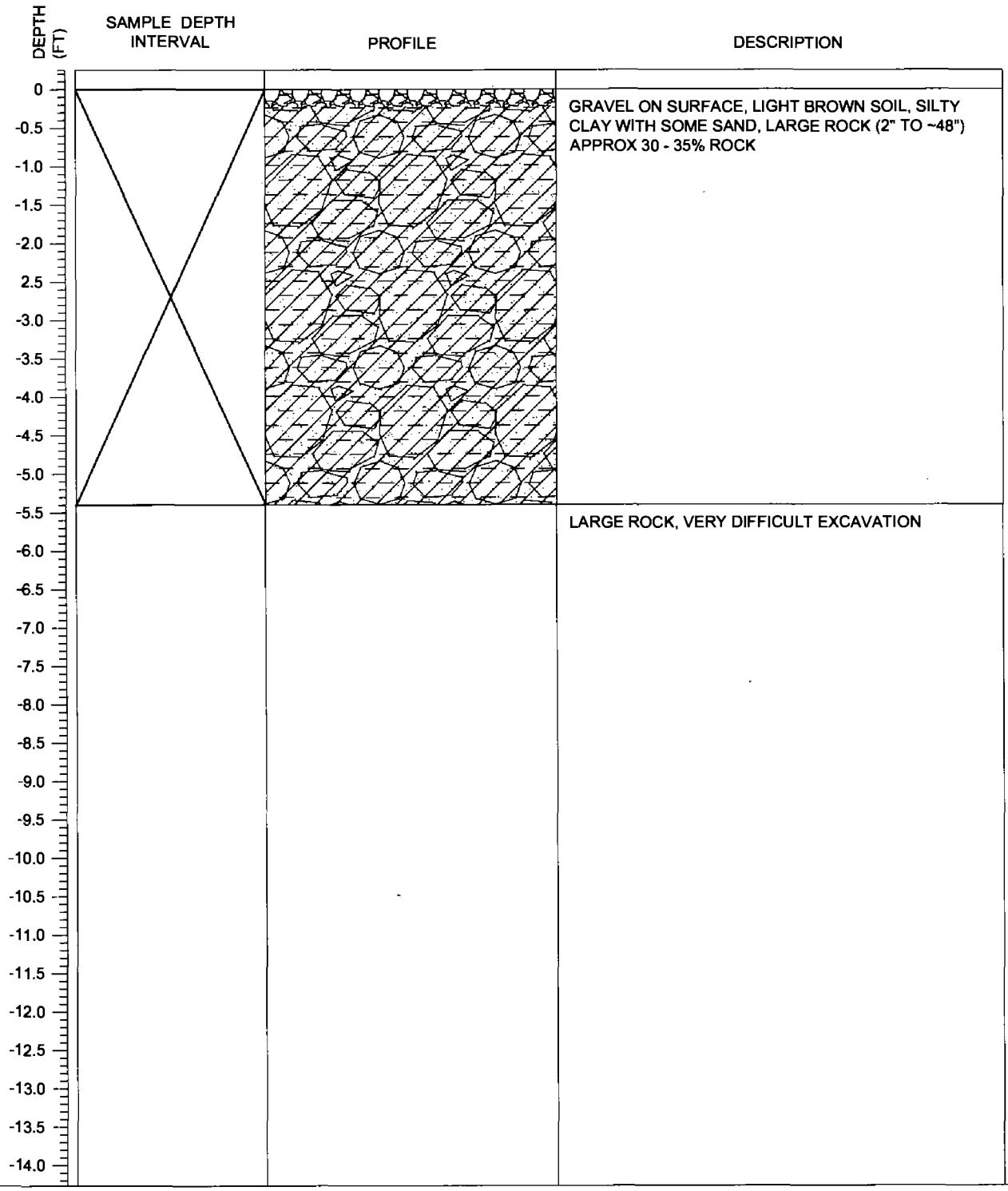
TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-16		COORDINATES OR LOCATION: LAT: 37.7064 LON: -108.0294
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: N/A (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/13/08 DATE COMPLETED: 10/13/08



TD = 5.4'

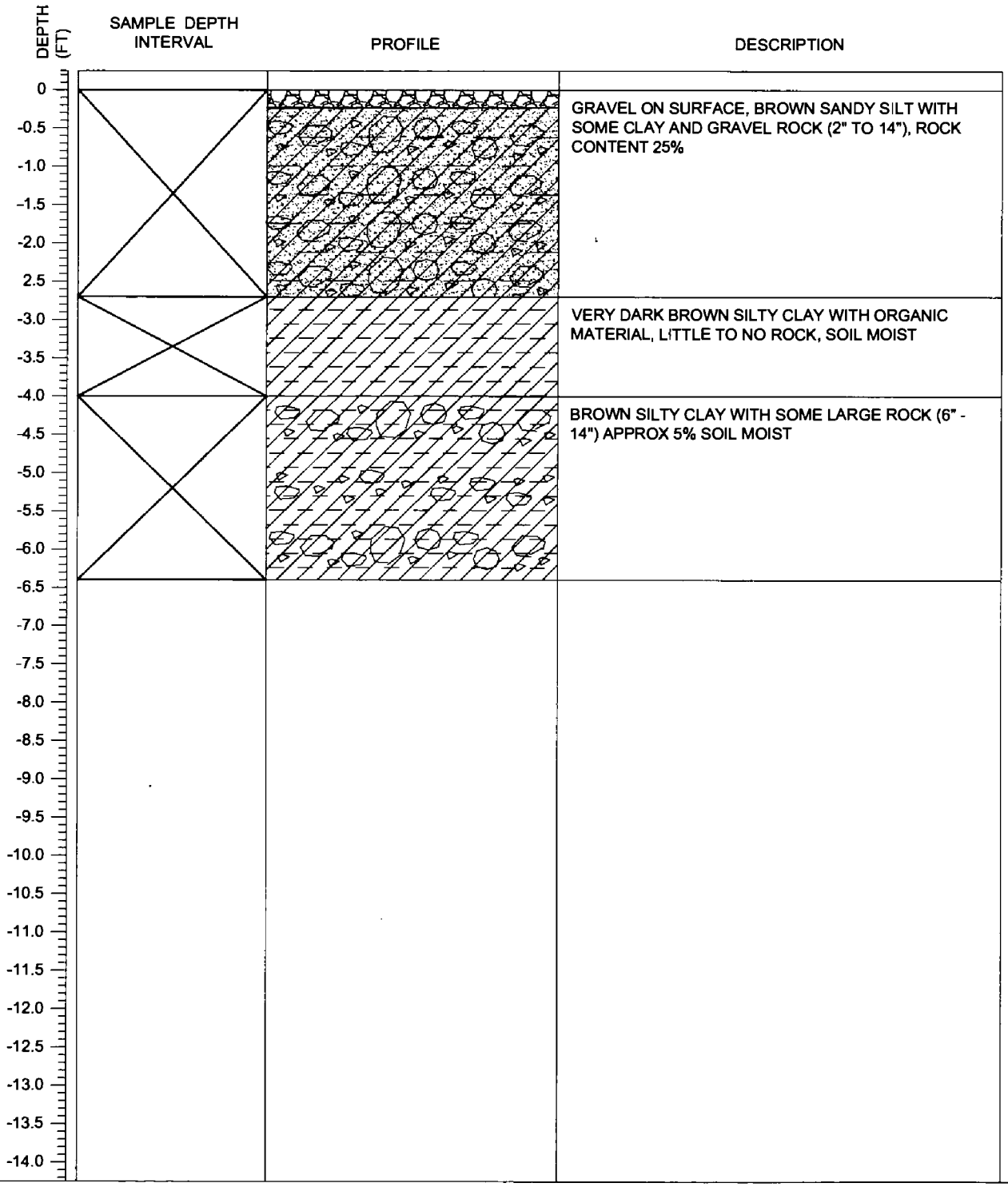
NOTES: TP-16 AND 15 SIMILAR SOIL PROFILES; TEST PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
ENGINEERING COMPANY, INC.

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-17	COORDINATES OR LOCATION:	LAT: 37.7074 LON: -108.0294
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: N/A GWL DEPTH:	(ENCOUNTERED) (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/13/08 DATE COMPLETED: 10/13/08



TD =

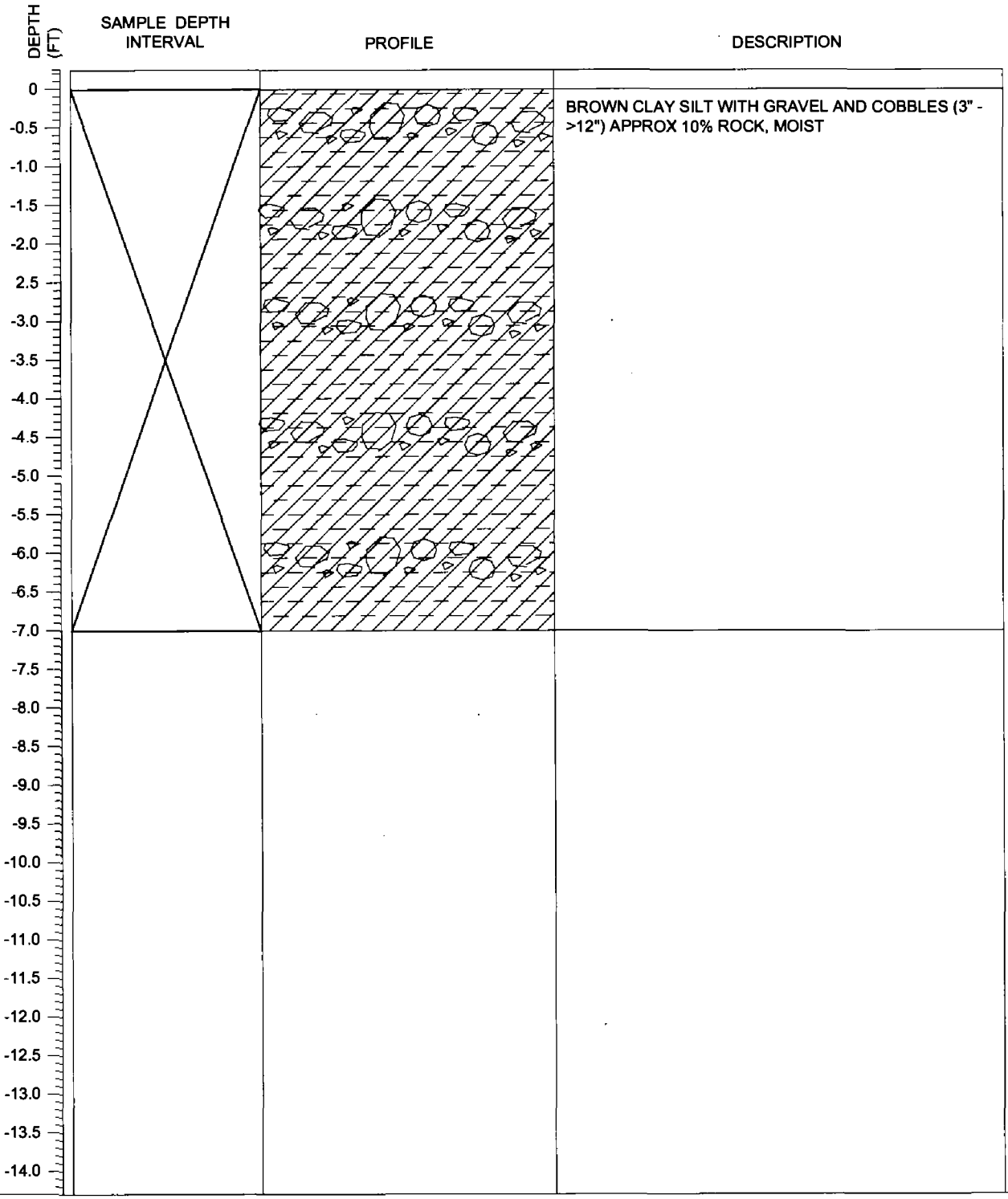
NOTES: TEST PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
ENGINEERING COMPANY, INC

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-18	COORDINATES OR LOCATION:	LAT: 37.7074 LON: -108.0299
LOGGED BY: KC CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: N/A GWL DEPTH:	(ENCOUNTERED) (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/14/08 DATE COMPLETED: 10/14/08



TD = 7.0'

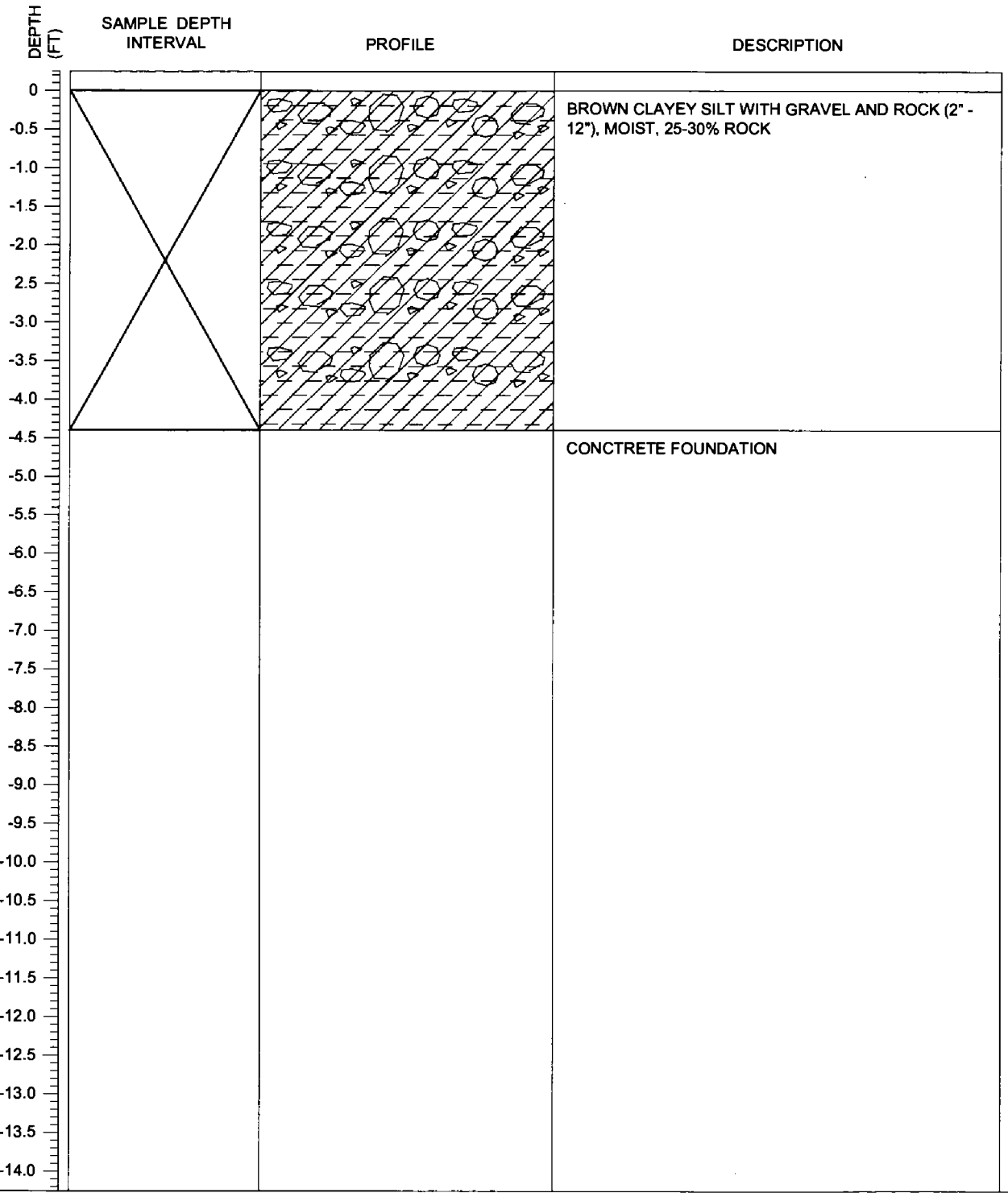
NOTES: TEST PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
ENGINEERING COMPANY, INC.

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-19		COORDINATES OR LOCATION: LAT: 37.7069 LON: -108.0298
LOGGED BY: KC CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: N/A (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/13/08 DATE COMPLETED: 10/13/08



TD = 4.4'

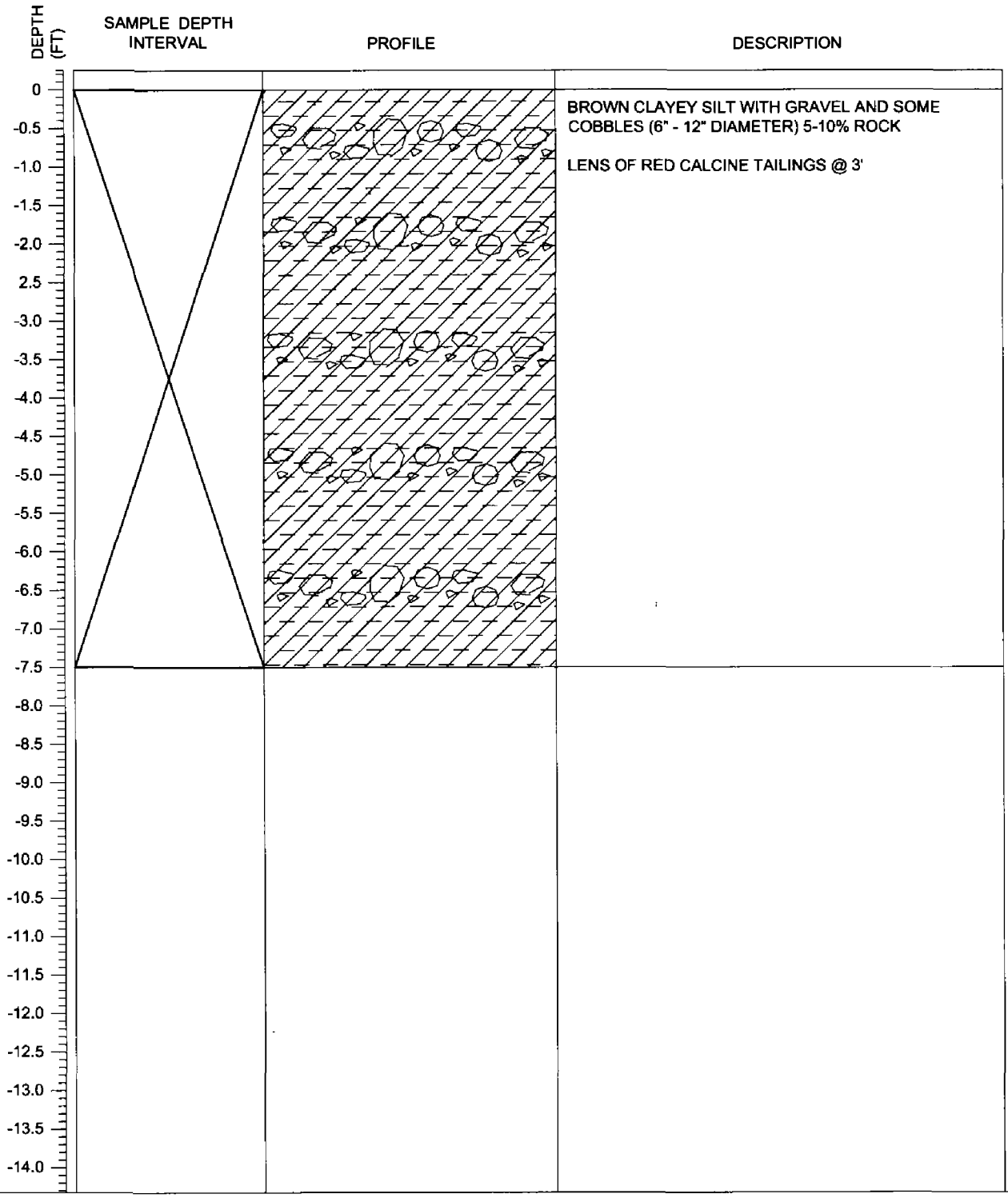
NOTES: TEST PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
ENGINEERING COMPANY, INC

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-20		COORDINATES OR LOCATION: LAT: 37.7064 LON: -108.0298
LOGGED BY: KC CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: N/A (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/14/08 DATE COMPLETED: 10/14/08



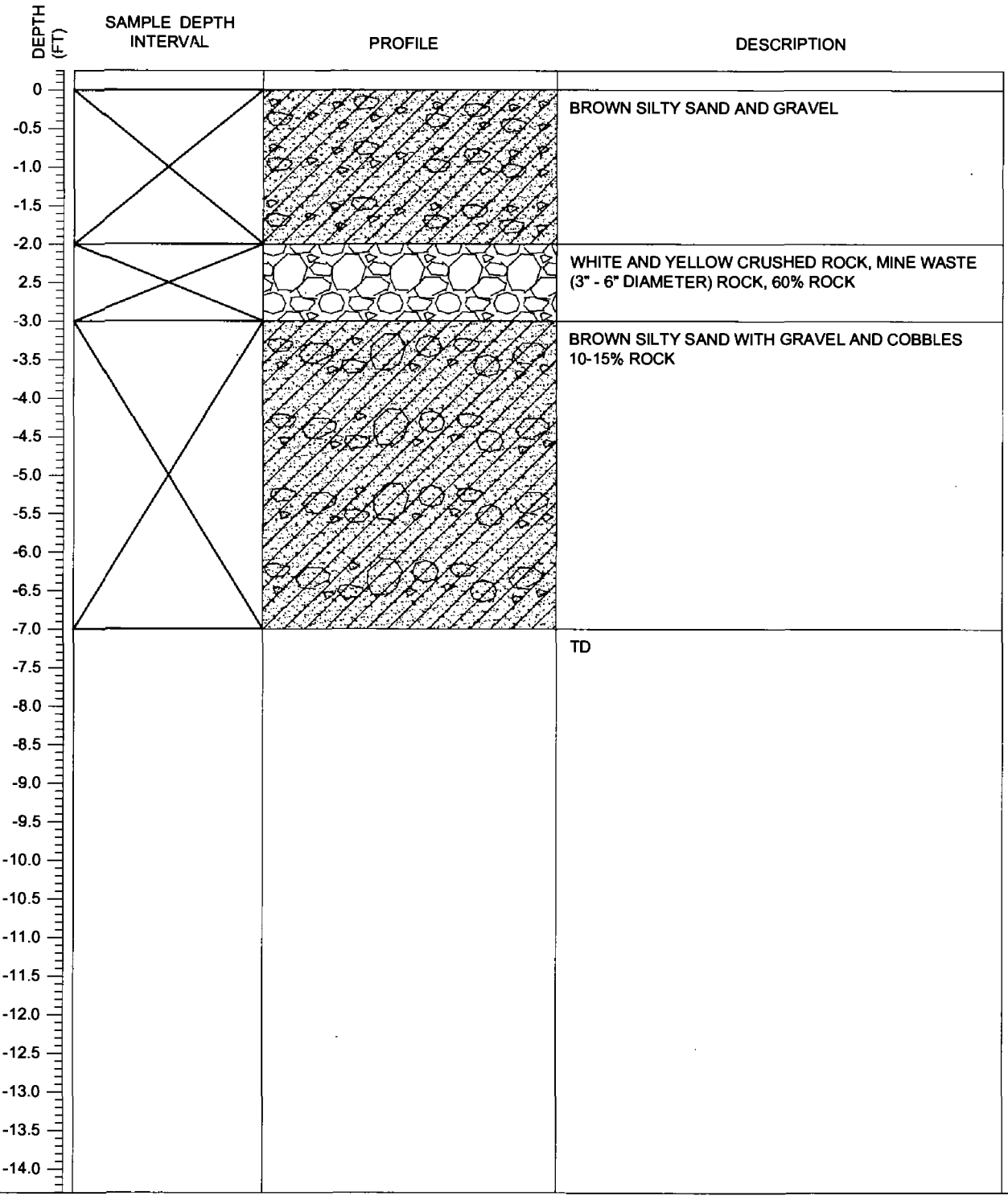
TD = 7.5'

NOTES: PIECE OF CONCRETE FOUNDATION WITH END OF PIT AT 2' DEEP, METAL DEBRIS FOUND IN ZONE CONTAINING THE CALCINE TAILINGS. TEST PIT BACKFILLED AND COMPACTED. X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
ENGINEERING COMPANY, INC

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-21		COORDINATES OR LOCATION: LAT: 37.7070 LON: -108.0302
LOGGED BY: KC CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: N/A (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/13/08 DATE COMPLETED: 10/13/08



TD = 7.0'

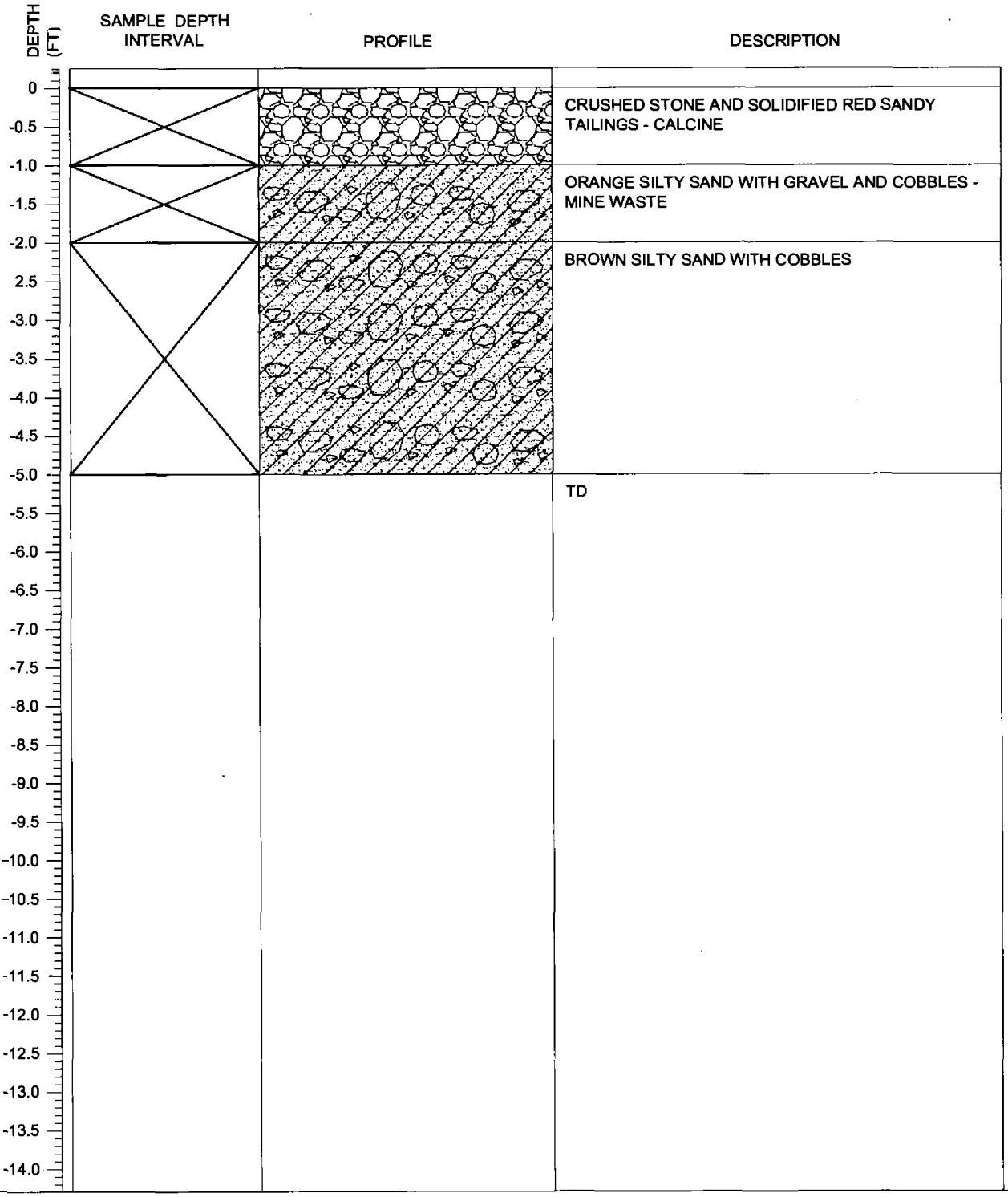
NOTES: TEST PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
ENGINEERING COMPANY, INC.

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-22	COORDINATES OR LOCATION:	LAT: 37.7075 LON: -108.0305
LOGGED BY: KC/CS CHECKED BY: SDA	SURFACE ELEVATION:	GWL DEPTH: N/A GWL DEPTH:	(ENCOUNTERED) (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/13/08 DATE COMPLETED: 10/13/08



TD = 5.0'

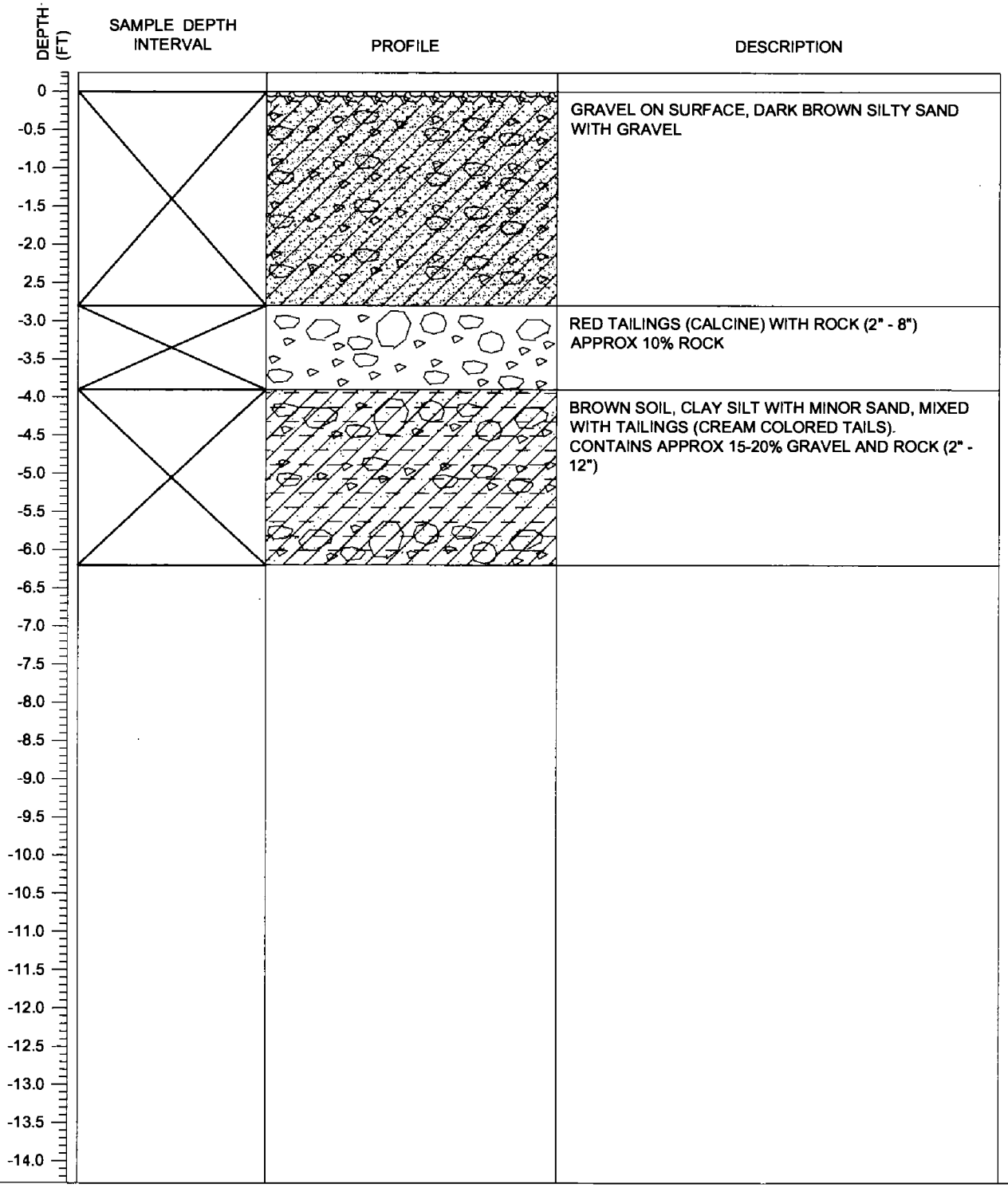
NOTES: STEEL PIPE IN TRENCH RUNNING N/S AT 1.2' DEEP. PIPE 9" DIAMETER. TEST PIT BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
ENGINEERING COMPANY, INC

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-23		COORDINATES OR LOCATION: LAT: 37.7079 LON: -108.0312
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: N/A (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/10/08 DATE COMPLETED: 10/10/08



TD = 6.2'

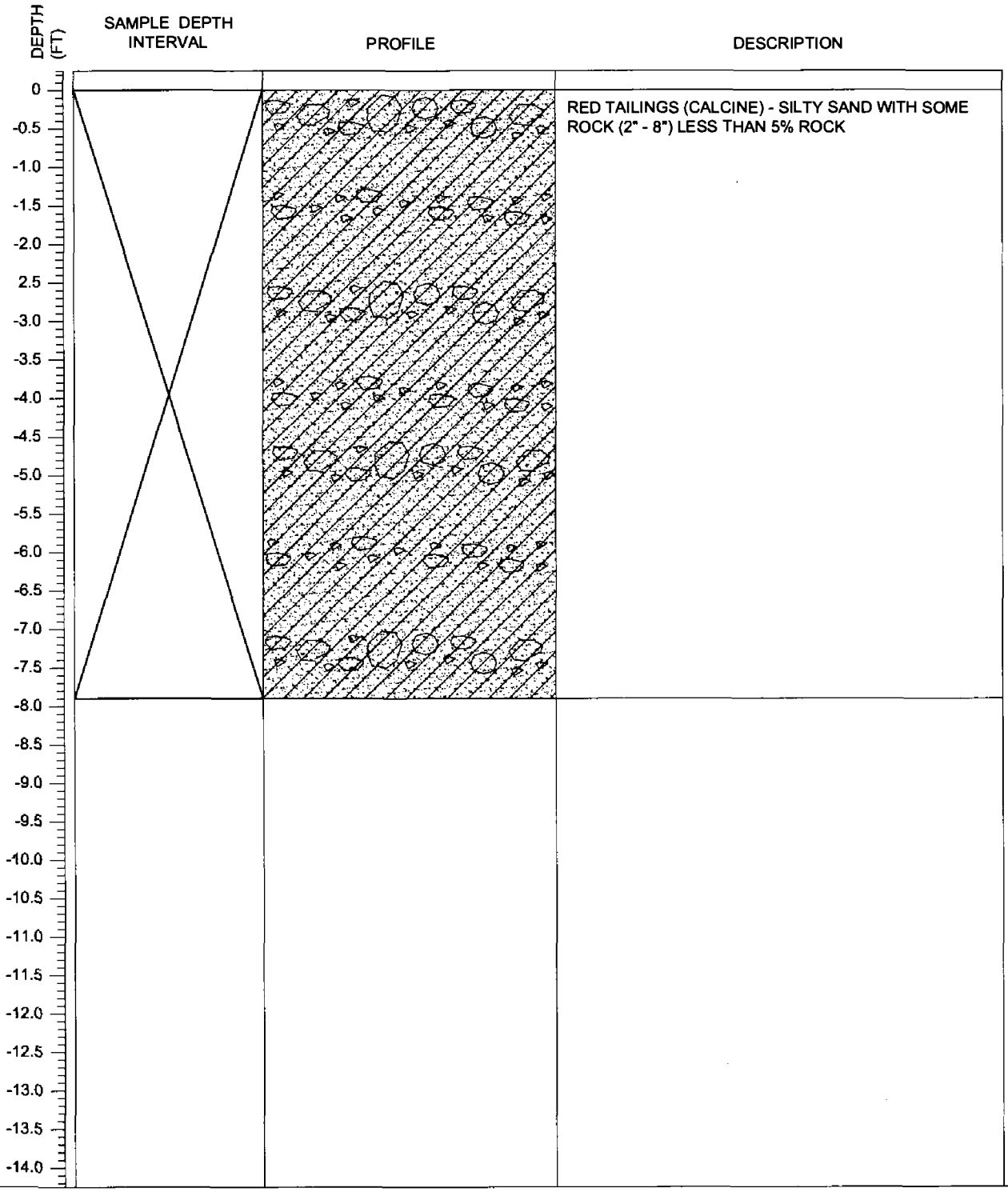
NOTES: NO WATER. BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
ENGINEERING COMPANY, INC

TEST PIT LOG

SITE NAME: RICO PROJECT: ST LOUIS PONDS	BORING NUMBER: TP-24		COORDINATES OR LOCATION: LAT: 37.7082 LON: -108.0317
LOGGED BY: CS CHECKED BY: SDA	SURFACE ELEVATION:		GWL DEPTH: N/A (ENCOUNTERED) GWL DEPTH: (STATIC)
DRILLING METHOD: BACKHOE TEST PIT	HOLE DIA: PIT	FLUID USED: N/A	DATE STARTED: 10/10/08 DATE COMPLETED: 10/10/08



TD = 7.9'

NOTES: BACKFILLED AND COMPACTED

X = SAMPLE COLLECTED, COMPOSITE OF MATERIAL

ANDERSON
ENGINEERING COMPANY, INC.

SEH 2004

TP-2004A

10:00 AM EXCAVATE TP-2004A

0'- 10.5' CAT 436B RUBB TIRE BACKHOE

COLLUVIUM, CLAYEY SAND AND GRAVEL, DARK REDDISH GRAY (3/1), BOULDERS TO 2.0', MOIST, MODERATELY DENSE BOULDERS AND COBBLES SUBROUNDED TO ANGULAR, ESTIMATE 30% >2"

TP-2004B

TP-2004B

0 - 7.0' COLLUVIUM

. CLAYEY SAND AND GRAVEL BROWN (4/3), MOIST, MOD DENSE, LOW PLASTISITY FINES, BOULDERS TO 1.0', COBBLES AND BOULDERS ANGULAR, TO SUBANGULAR ESTIMATE 20% > 2"

TP-2004C

TP-2004C

0 - 5.0' COLLUVIUM

CLAYEY SAND AND GRAVEL DARK BROWN (3/2), SLIGHTLY MOIST, FINES LOW TO MOD PLASTICITY, BOULDERS TO 3.0' ESTIMATE 15% > 2". COBBLES ANGULAR TO SUBANGULAR

TP-2004D

TP-2004D
0.0-1.5' TOPSOIL
1.5-6.0' COLLUVIUM
SILTY GRAVELLY SAND,
DARK REDDISH BROWN (3/4),
SLIGHTLY MOIST, LOOSE,
BOULDERS TO 1.0', SUBROUNDED
TO SUB ANGULAR. ESTIMATE
5-10% > 2"

TP-2004E

TP-2004E
N. OF POND 18 IN CALCINE
TAILINGS
0'-9.0' Calcine Tailings
9.0-12.0' RIVER COBBLES
WATER @ 8.0'

TP-2004F

TP-2004F
EAST OF POND 18
0-0.5' FILL
0.5-12.0' CALCINE TAILINGS

TP-2004G

TP-2004G
EAST OF POND 18
0-0.5 FILL
0.5-12.0' Calcine tailings

TA-2004 H
POND 16/17
0-4.0' FILL
4.0'-12.0' Calcine-tailing
GW@ 11.0'

TP-2004 H

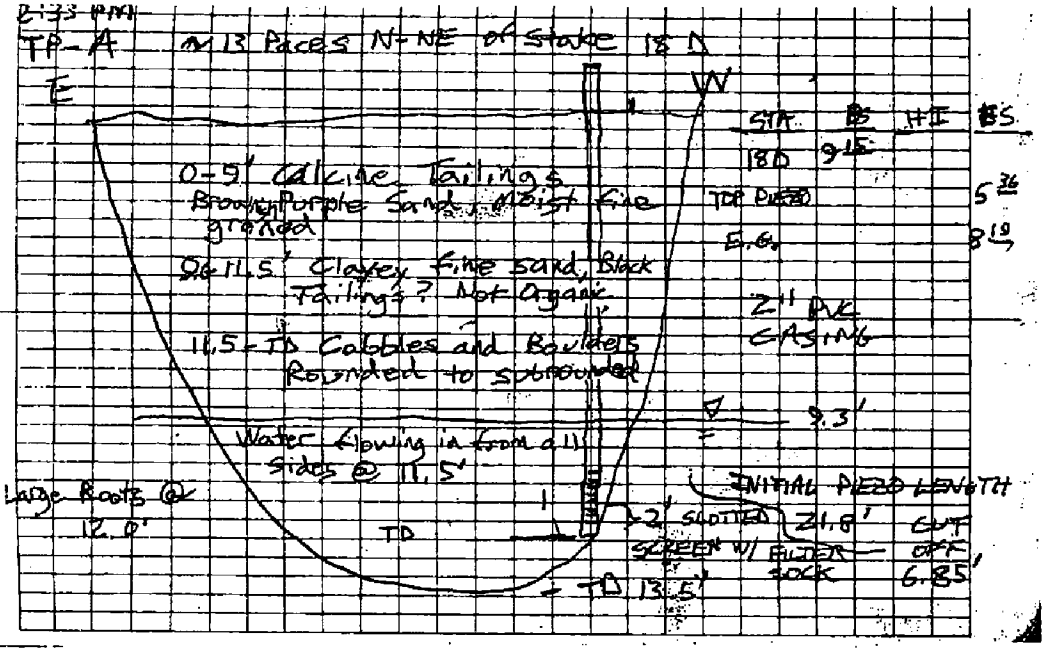
TA-2004 I
POND 16-17
0-12.0' Calcine Tailings
~~GW~~ GW@ 12.0'

3 SAMPLES EACH PIT

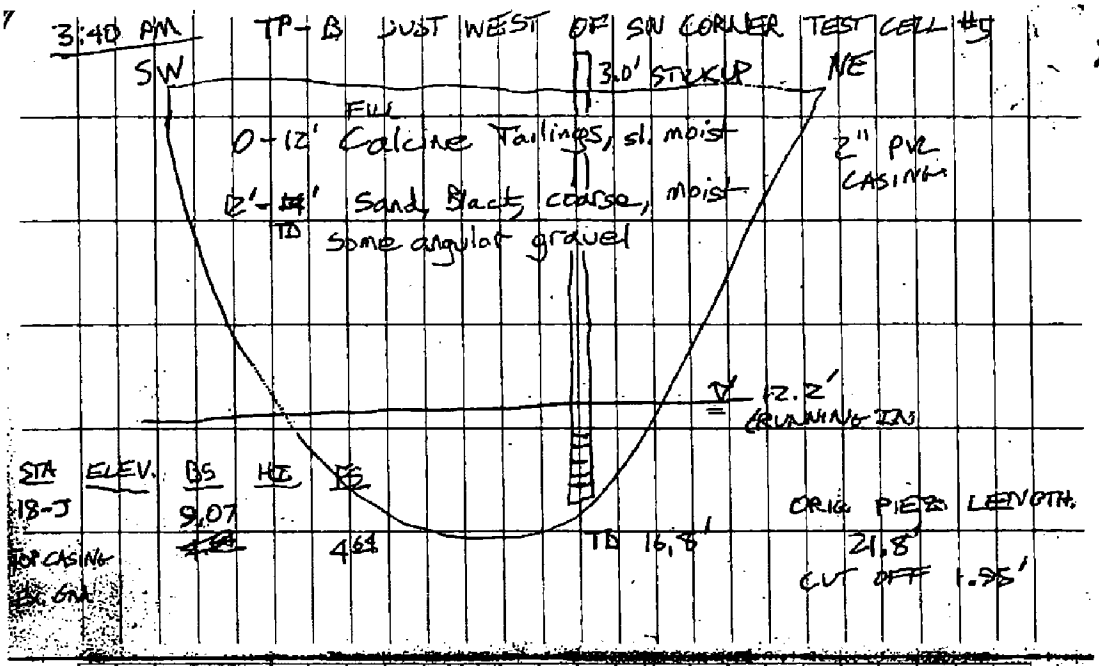
TP-2004 I

SEH 2001

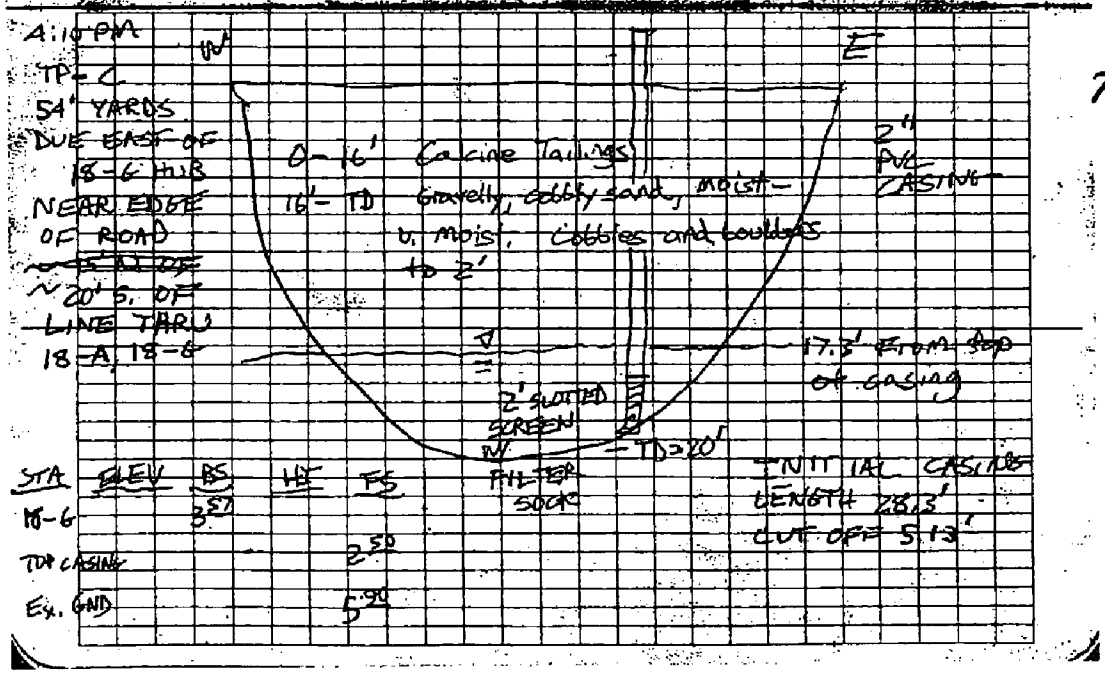
TP-A.



TP-B



TP-C



ANDERSON Engineering Company, Inc.
975 West 2100 South, Suite 100
Salt Lake City, Utah 84119
BUS (801) 972-8222
FAX (801) 972-8235

SAMPLING METHOD: BACKHOE PIT

LOGGED BY: JOEL MARTINEAU

ARCO

RICO RECLAMATION

BORROW MATERIAL

BORING NO. APB-1

SHEET 1 OF 1

DATE STARTED: 10 APR 96

DATE COMPLETE: 10 APR 96

TOTAL DEPTH: 3.0

SURFACE ELEV: 8895

N 26680 E. 20135

SAMPLE NO.	SAMPLE DEPTH (ft)	DEPTH (ft)	SYMBOL	USC
APB-1	0-3'	0, 1, 2, 3		SC-CL OH -GW

DESCRIPTION

SURFACE HAS ROCKS EXPOSED

0 - 0.7 Root ZONE Soil GRAYish BROWN SANDY-clay to clay w/ ORGANIC MATERIAL AND MINOR GRAVEL TO 1CM SIZE. Some Large Rock Sizes, Scattered.

0.7 - 3.0 FT
BROWN Soil w/ ISOLATED Sub-rounded rock
Texture SC-CL EST 5% Rock > 3".
Rock Fragments To 4 CM, Subangular.

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Salt Lake City, Utah 84119
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SAMPLING METHOD: BACKHOE

LOGGED BY: J. MARTINEAU

ARCO

RICO RECLAMATION

BORROW MATERIAL

BORING NO. APB-2
SHEET 1 OF 1
DATE STARTED: 10 APR 1996
DATE COMPLETE 10 APR 1996
TOTAL DEPTH: 3.0'
SURFACE ELEV: 8853
N 26710 E 19940

SAMPLE NO.	SAMPLE DEPTH (ft)	DEPTH (ft)	SYMBOL	USO	DESCRIPTION
APB-2	0-3'	0		SM-CL + GW	0-1.0' Root zone No noticable organics. Color Reddish-brown to yellow-brown (Limonitic & Hematitic) Fines sandy silt and clay. Rocks mostly sub-angular
		1			
		2		SM-CL + GW	1.0' – 3.0' Similar to above. Larger rock increasing percentage. Largest size 1.5 x 1.2 x 1.7. Two others over 1' screen size
		3			

ANDERSON Engineering Company, Inc.
075 West 2100 South, Suite 100
Salt Lake City, Utah 84119
BUS (801) 972-6222
FAX (801) 972-6225

SAMPLING METHOD: Backhoe

LOGGED BY: J. MARTINEAU

ARCO

RICO RECLAMATION

BORROW MATERIAL

BORING NO. APB-3
SHEET 1 OF 1
DATE STARTED: 10 APR 96
DATE COMPLETE: 10 APR 96
TOTAL DEPTH: 3'
SURFACE ELEV: 8836
N 26400 E 20000

SAMPLE NO.	SAMPLE DEPTH (ft)	DEPTH (ft)	SYMBOL	USC	DESCRIPTION
APB-3	0-3'	0		GW-SC-CL	NO NOTICABLE ORGANIC HORIZON BROWN Soil-Rock Mixture Subangular Rock - consistent gradation From Top to Bottom. (GROUND FROZEN TO 2.5 Ft)
		1			
		2			
		3			BOTTOM 3' WATER

ANDERSON Engineering Company, Inc.
975 West 2100 South, Suite 100
Salt Lake City, Utah 84119
BUS (801) 972-6222
FAX (801) 972-8725

SAMPLING METHOD: BACKHOE
VISUAL ONLY

LOGGED BY: J MARTINEAU

ARCO

RICO RECLAMATION

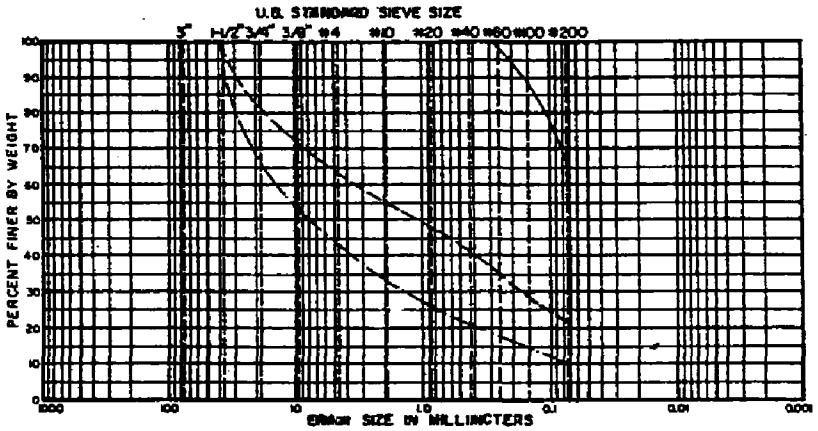
BORROW MATERIAL

BORING NO.	PPB-4
SHEET	1 OF 1
DATE STARTED:	10 APR 96
DATE COMPLETE:	10 APR 96
TOTAL DEPTH:	3.0 Ft
SURFACE ELEV:	8828
X: E	19870
Y: N	26475

SAMPLE NO.	SAMPLE DEPTH (ft)	DEPTH (ft)	SYMBOL	USC	DESCRIPTION
NONE TAKEN VISUAL ONLY	N/A	0 1 2 3		GW-GP	← Water level - Site is in River Gravels Mostly SAND & gravel. No Soil Horizons Fines About 45-50% 3-12" Rock 45% >12" 3-5% This Material consists Mostly of Rounded Rock & River Gravel; SANDY FINES

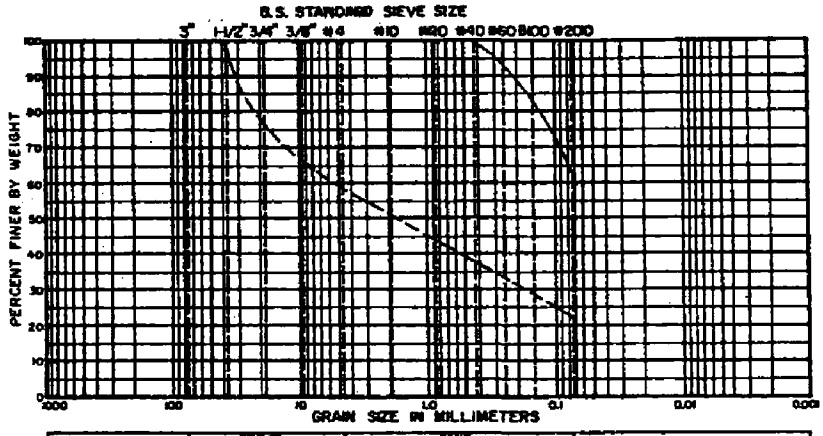
Geotechnical Data

- Dames and Moore, 1981



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LOCATION	DEPTH	CLASSIFICATION	KEY
B-9	19.5 Feet	[illegible]	
B-8	9.5 Feet	Yellowish Brown Fine to Coarse Clayey Sand With Some Gravel (SC)	
B-8	5.5 Feet	Brown Silty Fine Gravel With Clay (GM)	



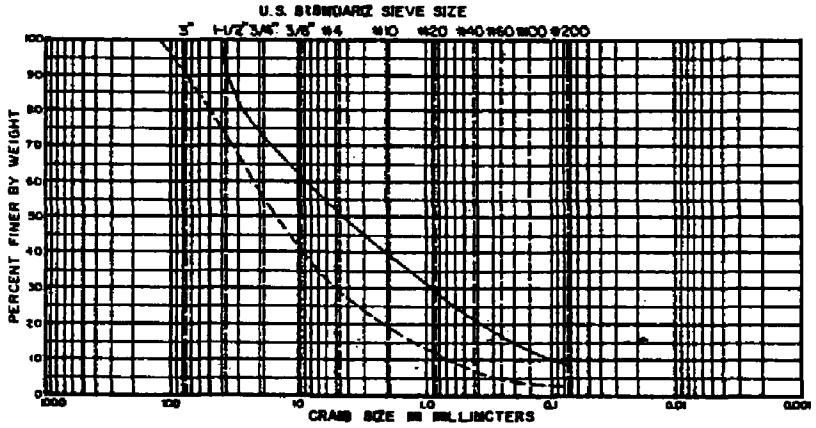
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LOCATION	DEPTH	CLASSIFICATION	KEY
B-11	20 Feet	[illegible]	
B-4	9.5 Feet	Brown Fine to Coarse Clayey Sand With Gravel (SM-SC)	

GRADATION CURVES

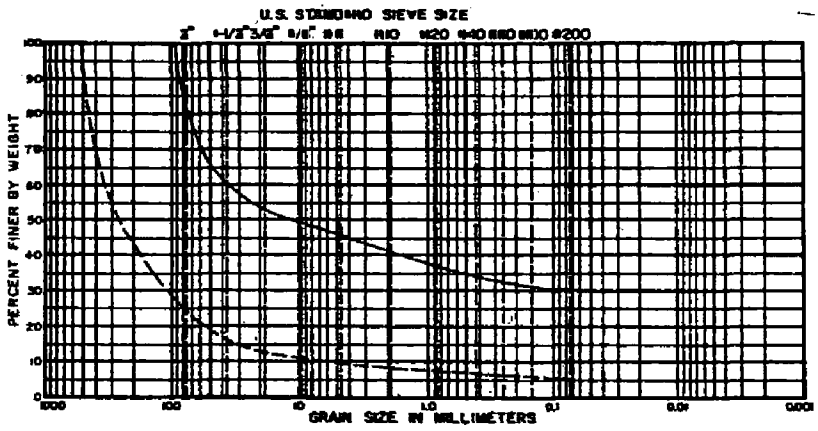
DAMES & MOORE

PLATE A-1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LOCATION	DEPTH	CLASSIFICATION	KEY
St. Louis Adit Borrow	From Cut Above Adit	Brown to Lt. Brown Sandy Fine Gravel and Gravelly Fine to Coarse Sand With Silt (GM-SM)	
Near Boring B-13	0' to 1'	[illegible] (GW)	

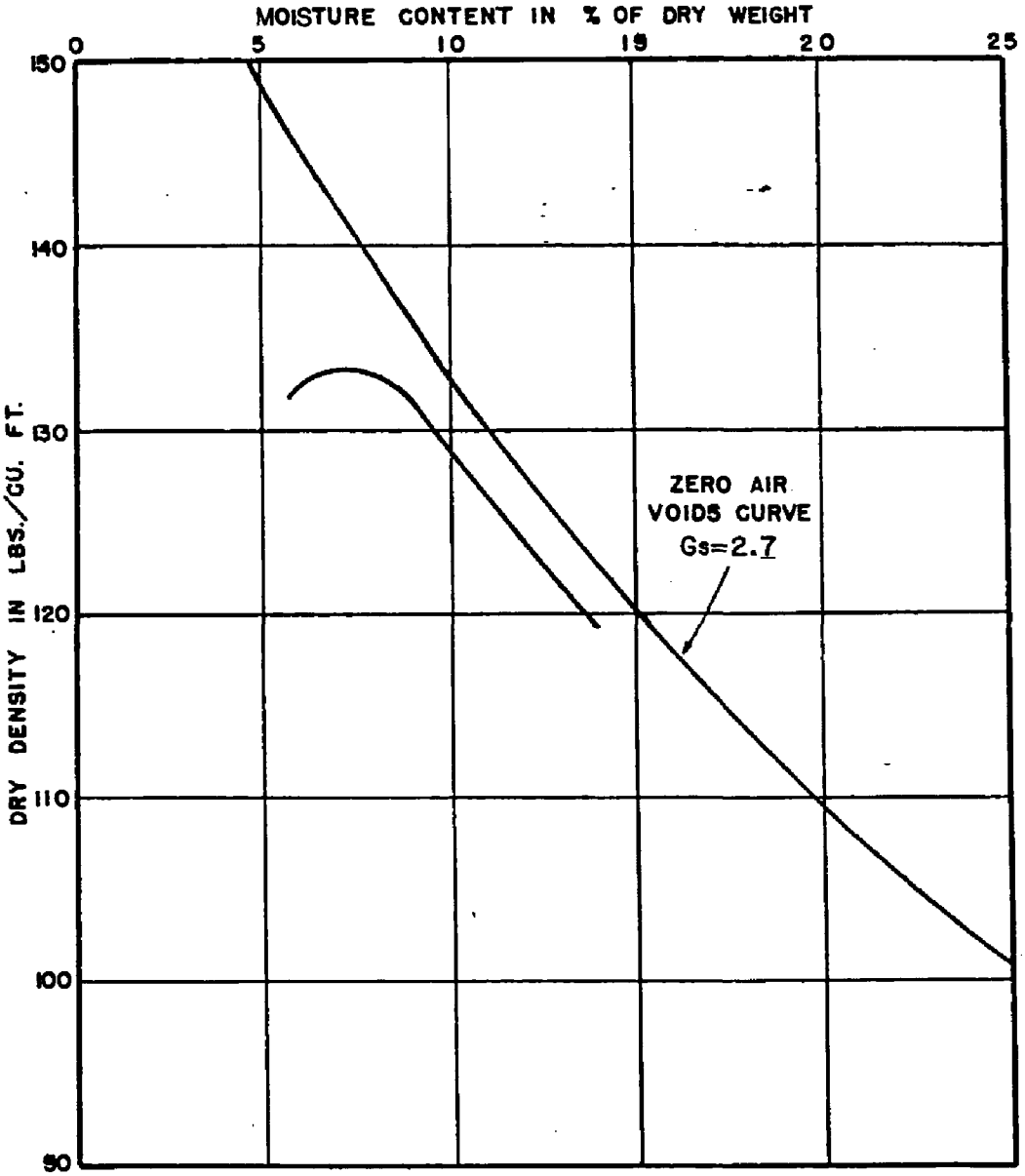


COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LOCATION	DEPTH	CLASSIFICATION	KEY
Diglerit River	River Bottr	Brown Silty Clayey Fine to Coarse Gravel With Cobbles (GM-GC)	
Dolores River	River Bed	Sandy Gravel and Cobbles (GP)	

GRADATION CURVES

SAMPLE NO. — DEPTH — ELEVATION —
SOIL Sandy Gravel and Gravelly Sand (GM-SM)
LOCATION Cut Above St. Louis Adit
OPTIMUM MOISTURE CONTENT 7.5 Percent
MAXIMUM DRY DENSITY 133 Pounds Per Cubic Foot
METHOD OF COMPACTION ASTM D-1557 Method C



COMPACTION TEST DATA

DAMES & MOORE

PLATE A-5A

SAMPLE NO. - DEPTH - ELEVATION -

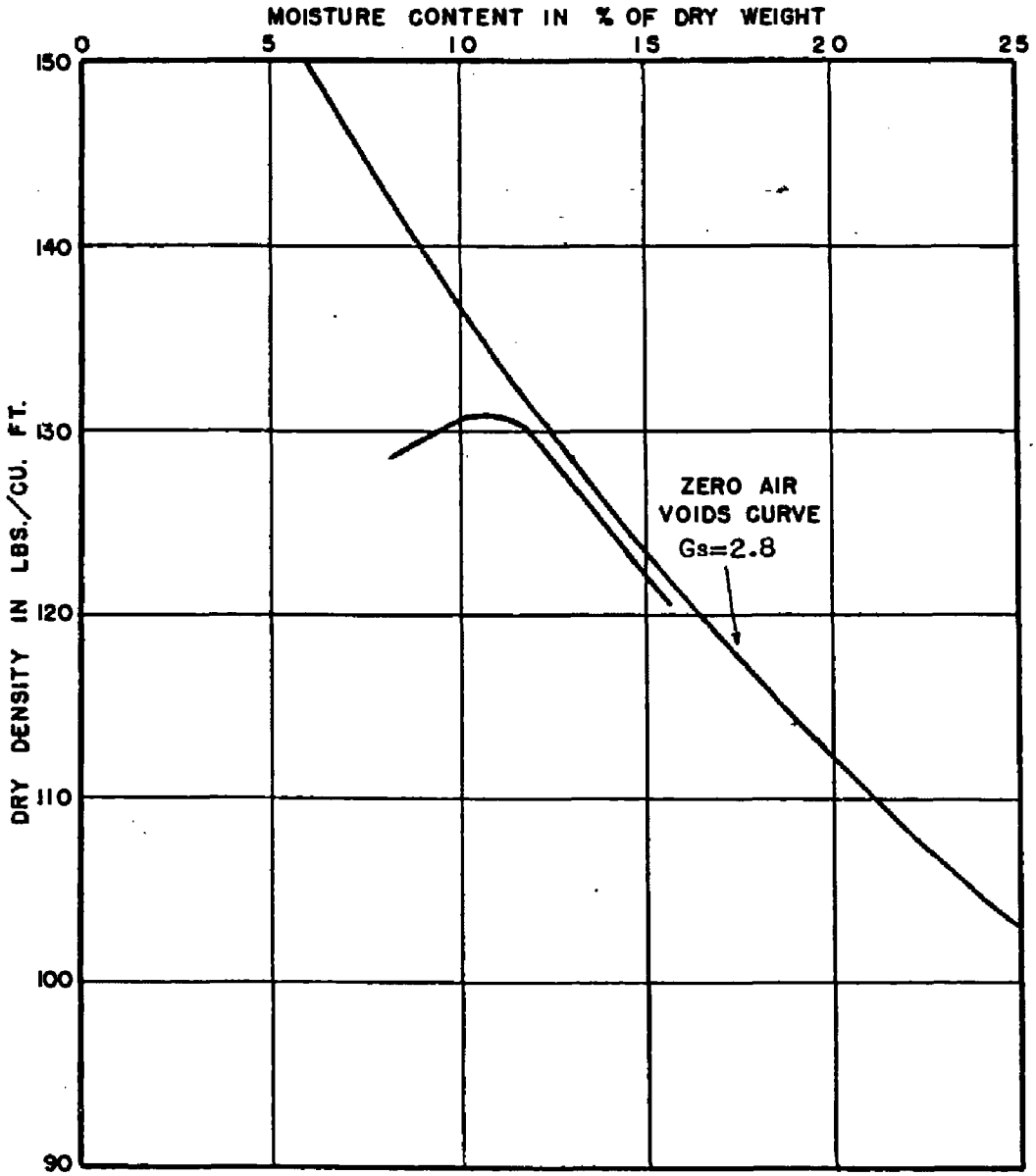
SOIL Brown Silty Clayey Gravel (GM-GC)

LOCATION Dolores River Bank Material

OPTIMUM MOISTURE CONTENT 11 Percent

MAXIMUM DRY DENSITY 131 Pounds Per Cubic Foot

METHOD OF COMPACTION ASTM D-1557 Method C



COMPACTION TEST DATA

DAMES & MOORE

PLATE A-5B

CHECKED BY _____ DATE _____

BY _____ DATE _____

BY _____ DATE _____

04010-082-1605

T (REV. 4-57)

APPENDIX C
MICROPROBE RESULTS

Sample **EB-1 (22-24)**

Sample is dominated by iron oxide, with abundant quartz, calcite, microcline and gypsum. Iron-poor clay is also found in minor amounts. Sphalerite, pyrite and galena are the dominant opaque minerals. Minor zinc and copper sulfate are observed.

Sources of:

Mn: sphalerite, calcite, clay
Cd: sphalerite
Cu: copper sulfate

Sample **EB-1 (18-20)**

Sample is dominated by iron oxide, with abundant quartz, calcite, microcline and gypsum. Sphalerite and galena are the dominant opaque minerals. Minor zinc and copper sulfate and jarosite are observed.

Sources of:

Mn: sphalerite, iron oxides
Cd: sphalerite
Cu: copper sulfate

Sample **EB-2 (7-9)**

Sample is dominated by iron oxide and microcline with some quartz and gypsum. Galena is the dominant opaque mineral. Very minor sphalerite and calcite.

Sources of:

Mn: sphalerite
Cd: sphalerite
Cu: ??

Sample **EB-1 (10-12)**

Sample is dominated by iron oxide and microcline with some quartz. Galena and sphalerite are the dominant opaque minerals. No gypsum was observed.

Sources of:

Mn: sphalerite
Cd: sphalerite
Cu: ??

Sample **EB-2 (5-7)**

Sample is dominated by iron oxide and microcline with some quartz. Galena and sphalerite are the dominant opaque minerals but not very abundant. Minor gypsum was observed.

Sources of:

Mn: sphalerite
Cd: sphalerite
Cu: ??

APPENDIX D
GROUNDWATER QUALITY DATA

Table D1

Groundwater Quality Data Summary

(all concentrations in mg/L)

Date	GW-1		GW-2		GW-3		GW-4		GW-5		GW-6		GW-7		GW-8	
Cadmium (dissolved)																
October 2002	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.015		0.007		0.002	
November 2004	0.0002	B					0.0011		0.0033		0.0004	U	0.009		0.0017	B
May 2005	0.0001	B	0.0015		0.0041		0.0001	U	0.0001	U			0.0373		0.0001	B
August 2005	0.0005	U	0.0012	B	0.0011	B	0.0001	U	0.0005	U	0.0005	U	0.0109		0.0002	U
January 2006	0.0001	U			0.001		0.0001	U	0.0005	U			0.0106		0.0001	B
July 2006	0.0001	U			0.0007		0.0001	U					0.0031		0.001	U
January 2007	0.0001	U			0.0004	B	0.0001	U	0.0001	U	0.0001	U	0.006		0.0001	U
Iron (dissolved)																
October 2002	0.16		1.1		0.095		0.3		4.6		630		0.18		41	
November 2004	0.07						0.23		1.42		8.79		2.78		178	
May 2005	0.01	U	0.22		0.01	B	0.45		1.92				1.31		7.09	
August 2005	0.02	U	0.15		0.02	U	0.36		7.57		151		0.13		15.3	
January 2006	0.11				0.02	B	1.24		3.44				9.09		21.9	
July 2006	0.02	U			0.02	B	22.3						0.09		22.3	
January 2007	0.02	U			0.02	U	0.28		3.95		153		8.79		18.3	
Manganese (dissolved)																
October 2002	0.0005	U	2.8		0.43		1.7		4.7		42		0.84		8.1	
November 2004	0.121						0.591		4.38		7.32		2.42		25.4	
May 2005	0.005	U	12.2		0.496		0.7		6.27				2.33		5.24	
August 2005	0.005	U	5.99		0.015	B	0.624		7.85		14.1		0.774		6.13	
January 2006	7.1				16.5		24.8		37.6				39.3		53.5	
July 2006	0.005	U			0.271		7.38						0.866		7.38	
January 2007	0.005	U	0.226		0.568		3.79		20.2		19.2		1.83		6.85	
Zinc (dissolved)																
October 2002	0.012		0.064		0.38		0.073		7.1		4.7		0.67		0.22	
November 2004	0.01	U					0.05	B	7.75		0.23		2.23		9.44	
May 2005	0.01	U	0.22		0.78		0.02	B	17.3				6.51		0.18	
August 2005	0.01	U	0.07		0.31		0.03	B	30.3		17.7		1.83		0.22	
January 2006	0.009	B			0.127		0.505		3.51				2.01		6.45	
July 2006	0.01	U			0.09		0.16						0.44		0.16	
January 2007	0.01	U			0.11		0.01	B	6.29		14.6		1.43		0.17	

U = undetected B= below practical quantiation level

Table D2
Minimum and Maximum Groundwater Concentrations
(all concentrations in mg/L)

		GW-1		GW-2		GW-3		GW-4		GW-5		GW-6		GW-7		GW-8	
Parameter	Analyte Type	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Alkalinity	Total	90	152	216	243	87	192	68	197	96	156	32	150	30	269	4	212
Arsenic	Dissolved	0.0001	0.017	0.001	0.017	0.0005	0.017	0.0004	0.0922	0.015	0.054	0.017	0.291	0.0003	0.017	0.0071	0.22
Arsenic	Total	0.0005	0.0378	0.0012	0.003	0.0005	0.0139	0.0011	0.213	0.071	0.152	0.174	0.429	0.0005	0.016	0.141	0.213
Barium	Total	0.058	0.058	0.067	0.067	0.017	0.017	0.039	0.039	0.019	0.019	0.033	0.033	0.015	0.015	0.03	0.03
Bicarbonate	Unknown	90	152	216	243	87	192	68	197	96	156	32	150	30	269	4	212
Cadmium	Dissolved	0.0001	0.002	0.0012	0.002	0.0007	0.0041	0.0001	0.002	0.0001	0.0033	0.0004	0.015	0.0031	0.0373	0.0001	0.002
Cadmium	Total	0.0001	0.0086	0.0013	0.0016	0.0013	0.0042	0.0001	0.0037	0.0002	0.0369	0.0003	0.0018	0.0036	0.0393	0.0002	0.0045
Calcium	Dissolved	48.2	82.7	215	351	156	224	224	505	573	632	502	502	271	404	405	505
Carbonate	Unknown	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Chloride	Total	0.5	1.3	1.2	2	0.5	5	0	10	0	0.8	0	0.5	0	5	0	5
Chromium	Dissolved	0.0001	0.0005	0.0002	0.0005	0.0001	0.0005	0.0001	0.0005	0.0001	0.0005	0.0005	0.0005	0.0001	0.0002	0.0001	0.001
Chromium	Total	0.0002	0.147	0.0005	0.003	0.0002	0.0015	0.0001	0.0043	0.0003	0.0092	0.0011	0.0011	0.0002	0.0014	0.0002	0.0073
Copper	Dissolved	0.0005	0.003	0.0012	0.004	0.0009	0.003	0.0005	0.0074	0.0005	0.023	0.001	0.005	0.0012	0.0309	0.0005	0.003
Copper	Total	0.0006	0.3	0.0099	0.01	0.003	0.0057	0.0005	0.0099	0.002	0.657	0.009	0.016	0.0041	0.033	0.001	0.043
Cyanide	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyanide	Unknown	0.005	0.005	0.005	0.005	0	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0	0.005
Dissolved Oxygen	Dissolved	0.004	0.73	0	0	0	0	0.0043	0.02	0.001	0.001	0.00097	0.00097	0.00065	0.46	0.0015	0.05
Hardness	Total	146	248	642	1030	458	678	662	1500	1610	1740	1490	1540	820	1260	1200	1630
Hydroxide	Unknown	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Iron	Dissolved	0.01	0.16	0.15	1.1	0.01	0.095	0.23	22.3	1.42	7.57	8.79	630	0.09	9.09	7.09	178
Iron	Total Recoverable	0.05	0.16	0.93	2.14	0.02	0.99	1.6	32.8	6.54	46.1	33.9	168	0.48	14.8	17.5	245
Lead	Dissolved	0.0001	0.014	0.003	0.014	0.0001	0.014	0.0001	0.014	0.0005	0.138	0.0131	0.041	0.0033	0.0293	0.0003	0.048
Lead	Total	0.0001	0.524	0.008	0.0206	0.0005	0.0193	0.0001	0.0871	0.0015	4.43	0.136	0.194	0.0125	0.11	0.0042	0.632
Magnesium	Dissolved	6.2	10	25.5	37.6	16.5	28.8	24.8	58.1	37.6	51.5	56.5	70	34.6	61.4	44.5	126
Manganese	Dissolved	0.0005	0.121	2.8	12.2	0.015	0.496	0.505	7.38	3.51	7.85	7.32	42	0.774	2.42	5.24	25.4
Manganese	Total Recoverable	0.005	48.8	6.22	13.1	0.38	0.965	0.532	6.79	3.51	9.04	7.09	15.2	0.792	2.68	5.08	24.3
Mercury	Dissolved	0.00003	0.0002	0.00003	0.0002	0.00003	0.0004	0.00003	0.0002	0.00003	0.0002	0.00003	0.0002	0.00003	0.0038	0.00003	0.2
Nickel	Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.05	0.46	0.01	0.05	0.0006	0.08
Nickel	Total	0.01	0.86	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.02	0.05	0.01	0.05	0.0006	0.02
Potassium	Dissolved	0.7	1.7	12.2	16.7	2.7	4.4	1.9	8.4	5.4	6	8.2	25.7	1.9	2.7	6.2	23.5
Selenium	Dissolved	0.0003	0.0007	0.0001	0.0002	0.0005	0.002	0.0001	0.0005	0.0001	0.0006	0.0002	0.0002	0.0004	0.0007	0.0001	0.0005
Selenium	Total	0.0003	0.001	0.0001	0.0001	0.0004	0.0018	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0008	0.0001	0.0005
Silver	Dissolved	0.00005	0.0003	0.0001	0.0003	0.00005	0.0003	0.00005	0.00005	0.00005	0.0003	0.0002	0.0003	0.00005	0.0001	0.00005	0.0002
Silver	Total	0.00005	0.00288	0.00017	0.0007	0.00005	0.0003	0.00005	0.0003	0.0001	0.0167	0.0001	0.0006	0.0001	0.00037	0.0001	0.0017
Sodium	Dissolved	2	4.4	7.9	13.1	3.8	5.7	9.6	11.7	11.2	15	4.2	11.6	6.7	10.3	10.3	10.9
Sulfate	Total	46.9	63.7	534	870	294	555	469	1180	1220	1580	1050	1910	542	1230	880	1190
TDS	Total	170	230	1060	1520	520	920	970	1950	2250	2550	2080	3170	1060	1960	1580	2910
TDS Calc.	Dissolved	160	200	932	1450	586	877	901	1910	2160	2330	2710	2710	1050	1730	1490	1950

Table D2 (continued)
Minimum and Maximum Groundwater Concentrations
(all concentrations in mg/L)

Parameter	Analyte Type	GW-1		GW-2		GW-3		GW-4		GW-5		GW-6		GW-7		GW-8	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
TSS	Total	0	103000	6	20	0	26	6	56	5	472	16	82	5	104	5	224
Zinc	Dissolved	0.01	0.012	0.064	0.22	0.09	0.78	0.02	0.16	6.32	30.3	0.23	17.7	0.44	6.51	0.16	9.44
Zinc	Total	0.01	7.14	0.11	0.24	0.14	0.74	0.02	0.29	6.51	36.3	0.39	19.9	0.48	6.59	0.19	9.51

Table D3

Groundwater Quality Data Summary

Dissolved Concentrations in µg/l (except as noted otherwise)

											by URS Start2					
Parameter (Date Samoled)	DWCD Test Well (8/5/2003)	RA-GW-01 (USFS Well) (1996)	GW1 (10/2003)	GW2 (10/2003)	GW3 (10/2003)	GW4 (10/2003)	GW5 (10/2003)	GW6 (10/2003)	GW7 (10/2003)	GW8 (10/2003)	RA-GW-02 Total (10/2003)	RA-GW-02 Dissolved	RA-GW-03* Total (10/2003)	RA-GW-03* Dissolved	RA-GW-04* Total (10/2003)	RA-GW-04* Dissolved
pH	7.05		7.4	7.3	6.4	7.2	6.9	6.4	6.5	6.5	7.67		6.44		7.44	
TDS	466,000										0.14		1.52		1.51	
Conductivity											0.29		3.05		3.02	
Temp Deg F			51.8	53.4	51.8	56.7	56.5	55.4	60.1	55.4	46.1		109.9		102.6	
Alkalinity	362,000															
Aluminum		8.0U									200U	200U	200U	200U	200U	200U
Antimony	U	3,0U									20U	20U	20U	20U	20U	20U
Arsenic	U	2.0U	17U	17U	17U	17U	17U	17U	17U	220	10U	10U	37	37	25	25
Barium	53	32.4B	58J	67J	17J	39J	19J	33J	15J	30J	130	130	100U	100U	100U	100U
Berylium	U	1.0U									5U	5U	5.6	5.6	5U	5.4
Cadmium	U	1.0U	2U	2U	2U	2U	2U	15	7	2U	5U	5U	5U	5U	5U	5U
Calcium		76,600									52000	53000	670000	680000	700000	700000
Chromium	U	1.0U									10U	10U	10U	10U	10U	10U
Cobalt	U	1.1B									10U	10U	10U	10U	10U	10U
Copper	U	4.0U	1.2U	1.2U	1.2U	1.2U	1.2U	5	1.2U	1.2U	170	14	10U	10U	10U	10U
Cyanide	U										10U	N/A	10UJ	N/A	10UJ	N/A
Flouride	U															
Iron		10.0U	160	1,100	95	2,300	4,600	630,000J	180	41,000	140J	100UJ	7600J	7200J	5900J	6900J
Lead	U	1.0U	14U	14U	14U	14U	14U	14U	14U	14U	5.4	3	6U	6U	6U	6U
Magnesium		5,750									9100	9400	86000	90000	81000	82000
Manganese		2.38	0.5U	2,800	430	1,700	4,700	42,000	840	8,100	12	10U	1,000	1,000	1300	1300
Mercury	U	0.20U	0.03U	0.03U	0.03U	0.03U	0.03U	0.03U	0.03U	0.03U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Nickel	U	1.0U									20U	20U	20U	20U	20U	20U
Potassium		4,680B									1000U	1100	27000	29000	26000	26000
Selenium	U	2.0U									5U	5U	5U	5U	5U	5U
Silver		1.0U									10U	10U	10U	10U	10U	10U
Sodium	7,600	2,250B									1200	1100	60000	62000	60000	59000
Sulfate	61,000															
Thallium	U	2.0U									10U	10U	10U	10U	10U	10U
Vanadium		1.0U									10U	10U	10U	10U	10U	10U
Zinc		76.2	12J	64J	380J	73J	7,100J	4,700J	670J	220J	90	20U	87	87	41	42

B - The associated numerical value was detected below the CRDL, but greater than the method detection limit and is therefore
J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met
U - The analyte was not detected at reported concentration (qualified by laboratory software). -or- The material was analyzed for,

APPENDIX E
RESPONSES TO EPA COMMENTS

Responses to EPA Comments[1]

on

Initial Solids Removal Plan Submitted May 2, 2011

by

Atlantic Richfield Company

July 7, 2011

SOLIDS REMOVAL PLAN (SRP)

COMMENT: As was discussed during our meeting in Denver on May 10, several elements of the solids management operation are conceptual at this time, and we understand that the plan proposes to obtain additional information during 2011 in order to develop final designs. However, some information already exists that would be useful in this document to support the initial decision to allow placement of the drying facility on the calcine tailings. The physical and chemical properties of the calcine tailings should be provided in this document based on historical data collection. Specific plans to collect data that will answer these questions must be explained also. These data should address the questions as whether the tailings can support the drying facility and that the flow of leachate through the tailings will not degrade downgradient groundwater or surface water quality. Please address these comments and those that follow in the revised SRP.

RESPONSE: See additional discussion of a site geologic and groundwater model for the proposed interim drying facility in Section 3.2 and a discussion of the calcine tailings and proposed geochemical sampling and testing in Section 3.3 of the revised Initial Solids Removal Plan (ISRP) dated June 30, 2011.

COMMENT: The depiction in this draft plan of the water level relative to the bottom of the proposed drying cells raises concerns, and it is of interest and should be monitored. It is understood that the water level data shown was projected from wells not in the immediate area.

RESPONSE: See discussion of groundwater levels and conditions in Section 3.2 and Section 3.3 of the revised Initial Solids Removal Plan (ISRP) dated June 30, 2011.

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[1] EPA Comments on Atlantic Richfield Submittals May 2, 2011: Sampling and Analysis Plan/Quality Assurance Project Plan/Solids Management Plan and Health and Safety Plan: transmitted via email from Steve Way/EPA to Chuck Stilwell/Atlantic Richfield on May 27, 2011 at 2:58 pm MDT.

COMMENT: Additionally, it is expected that details of the planned sampling and geotechnical analyses of the solids for purposes of design the repository and associated placement requirements will be forthcoming in a separate submittal.

RESPONSE: Comment noted and agreed to.

COMMENT: The plan submitted May 2, 2011 proposes to construct an "Interim Drying Facility" with multiple cells of varied design in a location above the water table to promote gravity drainage. An allowance for decanting water to the side of the cells is also included in case the gravity drainage concept is ineffective. The solids materials (mostly lime sludge precipitates) are estimated to have a permeability of around 1×10^{-5} cm/sec. hitially solids will be removed from pond 18 which has been subject to surface drying and some consolidation during dry seasons and by purposefully routing flow away from the pond to promote drying. The plan proposes that various methods of excavation and removal may be attempted including front end loader or low ground pressure long-stick excavators feeding haul trucks, and hydraulic suction dredges feeding pumped sludge pipeline system. The following comments are offered:

1. The proposed location of the drying cells above the existing water table is the most logical choice and is recommended to proceed to construction.

   RESPONSE: Comment noted.

2. What is the detail for the run on control ditch? Will the ditch be lined or will the uphill side of the embankments be constructed from low permeability fill to minimize the infiltration of ditch flow seepage into the drying cells?

   RESPONSE: The run-on control ditch/berm will be constructed of sufficiently low permeability soils and with adequate grade and freeboard to minimize surface water inflow or infiltration to the drying cells. The design of the system will be based on engineering judgment and the experience of the Atlantic Richfield design and construction oversight team.

3. Front end loaders are likely to be ineffective due to their limited reach and are liable to become stuck in the mud because of the high bearing pressure of the tires and are therefore not recommended for this work. Building earthen causeways or placing swamp mats is very time consuming and should be avoided if possible.

   RESPONSE: Comment noted.

4. It is not understood why a two-feet-thick layer of solids must remain in pond 18 as a "liner." If this layer could be eliminated (allowing excavation to a firm foundation) than the need for a low ground pressure excavator could be eliminated in favor of a more conventional excavator. A long-stick is recommended as the greater reach is very useful in projects of this nature and provides for a safer working environment by keeping the

machine away from the active excavation face which is prone to break off and slide without warning.

RESPONSE: It is Atlantic Richfield's intention to maintain a nominal thickness of relatively low permeability settled solids in the bottoms, and to the extent practical, on the side slopes, of the ponds during removal of solids to retain the option of further analyzing the need for and effectiveness of these materials in reducing seepage of pond water to the underlying typically coarse-grained alluvial aquifer. The additional evaluation of the pond bottom design will be performed as part of the upcoming water treatment technology screening and design tasks.

5. An initial test of stacking the material should be made in pond 18. If it is possible to dig and stack the material, to say 4 to 8 feet high along the side of the pond and let it stand for a day or two, a significant initial dewatering may occur. This extra effort can reduce the volume hauled out of the pond and speed subsequent drying and handling operations. The strength of the material can be quickly judged in the field by seeing how high an excavator can pile it up until the pile has a slope failure.

   RESPONSE: The suggested stacking of pond solids as described is judged not feasible based on prior experience at Rico and other Atlantic Richfield sites with similar lime-precipitated settled solids.

6. Drying in place in the cells is all that is proposed for the test and the material will be left in place over the winter. It is recommended that if drying in the cells is successful, further processing such as compaction in place or removal and compaction in one of the other cells be performed to take advantage of dry fall weather. Experience at several other similar projects has shown that the dry weather is a limiting factor to drying and consolidation and full advantage should always be taken of this seasonal benefit to reduce the material volume (even for a test operation).

   RESPONSE: Consideration will be given to this suggestion based on the measured and monitored performance of the test cells as proposed in the ISRP. This information will be used as part of the geotechnical evaluation and design of the solids repository.

7. Wet sloppy material tends to slosh around and spill out of trucks. Consider the geometry of the haul truck beds before making a selection as some are better able to carry runny material.

   RESPONSE: Comment noted.

8. No consideration of admixtures is included in the tests. Were they considered? We note the following results in dealing with sludge:

Admixture	Comments
Dry granular soil, gravel, or waste rock.	Dry soil can absorb water and increase strength. It has the disadvantage of significantly increasing disposal volume and requires an on-site borrow source to be cost effecfive as the addifions are in the 20 to 35% range.
Cement	Excellent in adsorbing water and improving strength of very weak material. Increases disposal volume slightly. Usually a few bench scale mixing tests are performed to determine the amount of cement addition.
Fly ash or lime	Absorbs water and improves strength, to be cost effective a low-cost source would need to be idenfified.

RESPONSE: The decision as to whether or not to consider amendments will be based on the measured and monitored performance of the test cells as proposed in the ISRP.

9. Proposed drying cell 3 (placing runny material on a clean gravel without a filter is not recommended. The sludge is likely to migrate into the gravel and eventually clog it thus creafing a larger disposal volume. Consider instead performing a test using either a "dirty gravel" (one that meets filter criteria, or cover the gravel with a thin (8 or 10 oz) non-woven geotextile which has a fairly large opening size (AOS not smaller than 100).

   RESPONSE: It is Atlantic Richfield's intention to construct drying cell 3 as described in the originally submitted ISRP in order to evaluate the nature and degree of intrusion of solids into a gravel drainage media, and the impact of that intrusion on the effectiveness of the gravel drain (even if partially clogged) to effectively convey pore water released by gravity drainage of the overlying treatment solids. The performance of this unfiltered cell will be compared with the performance of the similar but filtered drying cell 4.

10. It appears that pond 18 has denser and more consolidated material than some of the other ponds. The proposed cell placements should be targeted to the consistency of the specific material to be placed. Proposed cells 1 and 2 are only likely to be useful for sludge which can be loaded into trucks. For very watery material where dredging may be the only practical opfion for transport, the ponds with a designed bottom drain/filter are more appropriate. A few minutes of digging with an excavator and trying to load the material is a quick and easy way to judge if the sludge should be excavated and put into trucks or if it should be dredged. Where the volumes of material to be dredged are small, a super sucker truck has been more cost effective than a dredge feeding a pump and pipeline.

    RESPONSE: Comment noted.

11. Where feasible, excavation and truck hauling should be the favored handling method. Experience on several jobs has shown that this can be accomplished at lower costs (about 1/3 the cost per cubic yard of pumping) and in less time than a dredging, pumping, and drying operation.

RESPONSE: Comment noted.